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Selling Machine Tools in Dull Times

How a Progressive Sales Department Is Going After Business in Dull Times and Getting It—New Outlets for Machine Tools

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IN THESE days the job of the machine-tool sales manager isn't what it used to be by any means. It is no longer even remotely possible for the star salesman to take orders for $800,000 worth of turret lathes in one year, as one of our men did when the boom was at its height. Neither is it the principal occupation of the sales office to apologize to irate customers for the unavoidable delays in filling their urgent demands for machine tools.

There is a keen fight on for every order placed. If you don't believe it drop a hint that you might possibly be in the market for a lathe or a milling machine or a shaper and see what happens. Four different men from our sales force visited one man in six weeks. I was the fourth and he gave me an order for two machines on condition that we would all stay away from him for a while. He wanted the machines all right, and they have been working at full capacity ever since we set them up, but he had economized so long that he thought he could get along a while longer with his old equipment.

THOROUGH CANVASS of the machine shops of the United States produces a list of carefully investigated prospects three times as big as the old list.

Sixty per cent of 1921 business came from new customers, a good sign for the future.

Lending time-study men and production and planning engineers to customers during hard times is a scheme that produces good results for everybody concerned.

One of the first things we did when we realized the probable extent of the business depression, was to make a thorough survey of the possible market for turret lathes. We began by checking over all available prospect lists. They showed the names of twenty-five hundred machine shops or manufacturing concerns which either used turret lathes, and therefore would probably be buyers of more such tools in the future, or else did work which could be handled by turret lathes. This didn't look very encouraging and, what was more, did not seem to check up very well with our ideas of what the field really held for us.

We went back over what statistics were available and discovered that the total sales of turret lathes by all manufacturers for the year 1918 were approximately $30,000,000. That year was, of course, an abnormal year but we estimated that, even with all foreign business eliminated there ought to be a market for half the quantity sold during that period, as soon as industry began to get into its stride. Then we took stock of the competition. Careful investigation showed that this was not so serious as it seemed, due principally to the fact that some of the companies had turned their efforts to the perfection and sale of other types of machine tools which were not directly in competition with our turret lathe.

This was reassuring, but did not help much in the current situation. We might all starve to death before any of these promising prospects reached the ordering point. We continued our intensive sales methods on the prospects listed, but in addition we started a canvass of every shop in the country. The reason for starting the canvass was the receipt of several orders from companies which had never been thought of as possible prospects. Investigation showed that each of them had a more or less well-equipped machine shop where one or more turret lathes could be used to advantage.

The results of the canvass were surprising. Twenty-seven men combed the country and as a result we wound up with a prospect list containing more than seven thousand names. And there was no dead wood on this list, because each shop had been visited and we knew exactly what its situation was. On the Pacific Coast, for instance, the canvassers found some four hundred shops, of which more than a hundred were good prospects for turret lathe sales. Here is about as good an indication of the progress of industrialization west of the Rockies as you could want.

Another surprising fact about the machine-tool market, as far as we are concerned, is that 60 per cent of our 1921 business came from buyers who had never been on our books before. From what I can learn from other machine-tool builders their experience during the past year has been much the same. Here, certainly, is an encouraging factor. With all this new business in sight the industry should prosper when the old customers, whose good will has been secured through efficient service, recover to the point where they can begin to replace their obsolete equipment.

In going after immediate business we have hammered away at the idea that what the buyer should consider is not the price of the equipment he buys, but the cost of the product of the machine as applied to his needs. There is nothing new about this thought but a lot of manufacturers have never heard of it.

Several months ago I got into a shop where I was

sure, because of information volunteered by men in neighboring shops, that we could make big savings if our turret lathes could be introduced. The works manager was a young engineer who had grown up in the plant and whose knowledge of manufacturing methods in other plants was limited. He was a live citizen all right, but he was cursed with the complacency that is all too common in American shops. He told me with some pride that, although he had only been on the job a year, he was getting out the same amount of work as had his predecessor, and with a hundred less men on the payroll. As a result he felt that the acme of efficient management in that particular plant had just about been reached, and he was inclined to look on my claims for our machine with considerable condescension.

The Time To Play Trumps

He was using our brass-working machines in his brass department and he assured me that they were so satisfactory that he wouldn't have anything else in the place. But when it came to handling iron and steel we just weren't in the running. Had he ever used one of our turret lathes? No, he hadn't, but he was positive that they could not equal the production of his present machines. I saw there was nothing to do but play trumps so I made him the offer we sometimes make to first-class shops where we are unusually anxious to break in. I offered him a machine all tooled for his hardest jobs to use as he saw fit for a year if he desired with the understanding that it could be returned to us at the end of that time if it failed to live up to the claims I made for it, and that it would cost his company nothing for the trial.

He thought I was joking at first but when he found I was serious he accepted the offer, for he really was a live citizen. He thought I was crazy, but I hadn't made that offer until I was certain of my facts and it really was a sure thing as far as we were concerned. Inside of four months he was satisfied and we had an order for more turret lathes. Now he is one of the best boosters we have among our customers.

So much for the plan of action when you are trying to break into a shop. The other side of the question faces you when a competitor tries the same plan to replace your machines. We have been up against this several times and the best defense we have found so far has been to lend one or more of our time-study and production men to the customer to show him how to speed up his present equipment by redesigning the tooling, changing speeds and feeds, etc.

To my mind, this use of production and planning department men during periods of depression like the present, is advantageous to everybody. Their own company gets the benefit of the missionary work they do and the good will they create and is able to keep them on the payroll. They, themselves, grow in experience as a result of their work in outside shops. And the customer benefits from the more efficient production methods which their skill and experience introduce into his shop. Some of us were a little skeptical of the idea when it was first suggested, but after several of our engineers who specialize on outside jobs had been turned loose in our own production department, we were convinced. I am not going to say what savings they made in departments that were thought to be about the last word in efficiency. Pride forbids.

Now a word as to some of the new fields for machine-tool sales. One that opened itself up for us recently is the musical instrument industry. More by good luck than for any other reason we got an order for a small machine for turning up bugle mouthpieces. The customer was near by and although his shop was small he made good money out of his purchase. In order to get more business from others in the same line we took photographs of the machine and its work and sent them out to a selected list of musical instrument makers with a good strong selling letter. There was no wasted effort in this list; we knew exactly to whom we were talking and we were able to talk their language by reason of our experience in satisfying the requirements of a man in their field. We got results.

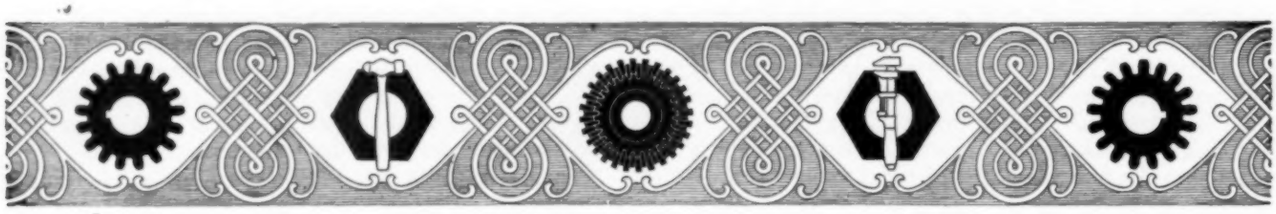
The same methods have been used on prospects who made bottle molds and lamp bulb molds, and with equally pleasing results. In one case we increased production six times and broke a strangle hold which a local union of the old-fashioned kind had had on a plant for years.

The Passing of the Old Salesmen

One more factor in the present selling situation and I am through. The easy order days which began with the war and lasted for some months after the armistice had their effect on the older machine-tool salesmen. Some of them cleaned up so much during the prosperous times that they were able to retire from active selling. Others couldn't stand prosperity and went to pieces. Still others contracted the bad habit of trying to stand on their reputations as order getters and became of little use for keenly competitive selling, as it exists now.

The upshot of it all has been that most of them have been succeeded by a new generation of younger men who are aggressively ready to fight for every order and who are possessed of a brazen persistence that is unsquelchable. Most of them have no great accumulation of laurels to point to and are willing to be judged on present performances. Their achievements will be worth watching.

On the whole the future for the sound concerns in the machine-tool industry looks anything but gloomy to me—even the immediate future. The sales forces have thrown off the lethargy of the seller's market and are on their toes. New uses for the tools are constantly cropping up. There is much to be done in educating users to the most efficient employment of the equipment they have. The new tools that most of us have to sell are far and away better than anything we have ever had before and consequently easier to sell on their merits. Competition is keen and will continue to be, but what red-blooded American dislikes competition? We are willing to take our chances.



Railroad Shop Methods and Tools

Pump for Testing Gages—Reclaiming Air Pump Gaskets—Slotting Machine Arranged for Gear Cutting—Machining Crown Brasses—A Steam-Heated Layout Table

By S. ASHTON HAND
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APART of the toolroom work in the Norfolk & Western Railway shops at Roanoke, Va., is the repairing of all the steam and air gages used on the system. Not only are the gages repaired, but the cases are first thoroughly cleaned from the grease and dirt baked on them and then dipped in acid so that they look like new when put back into service. In Fig. 1 is shown a very convenient test pump with its stacks of weights —some on the plunger at *A* and others at *B* within easy reach of the workman. The gage mounted on the test pump is a duplex air-gage and it will be seen that a siamese connection is used for attaching it to the pump. By this arrangement the Bourdon springs of both the train line and the reservoir sides of the gage can be tested and the indicating pointers set without breaking the connection. At *C* is the small screw jack used for pulling off the pointers.

All of the lathes used in the toolroom are equipped with swinging cranes to aid in removing and putting on the chucks and to hold them when not in use. A

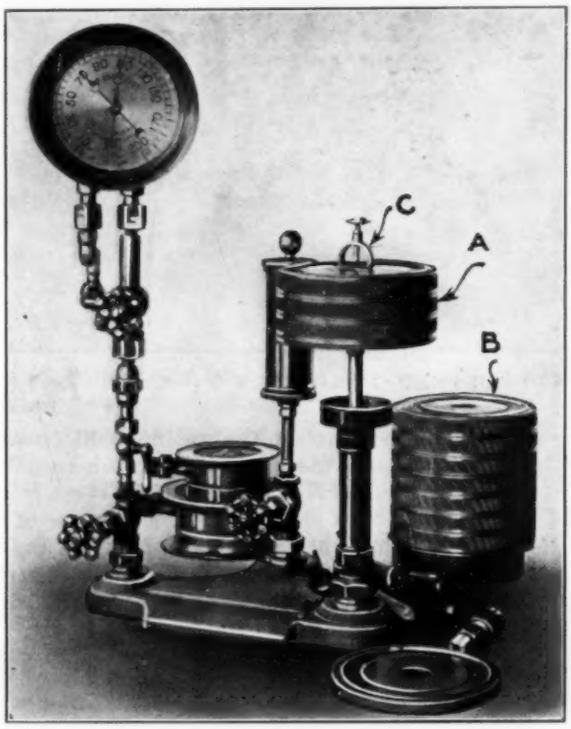


FIG. 1. TEST PUMP FOR GAGES

chuck with an uncompleted job in the jaws is shown in Fig. 2, suspended from the crane on one of the lathes.

The article represented by Fig. 3 is not a drum, as might at first be supposed. It is a pulley for a grinding stand. The criss-cross grooves keep the belt from running against the pulley flanges and curling up at the edges, as everyone who has had to do with high-speed belts knows is apt to be the case. The grinding stands in several shops of the system are equipped with these pulleys and from all reports they appear to be making the belts attend strictly to business.

The punches and dies used in boiler and sheet-metal

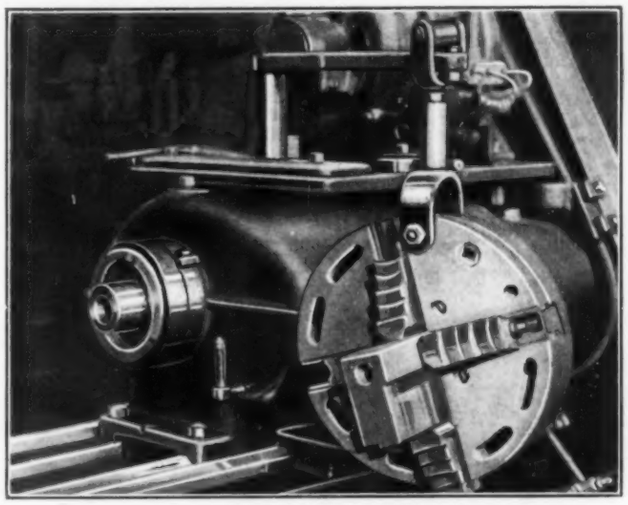
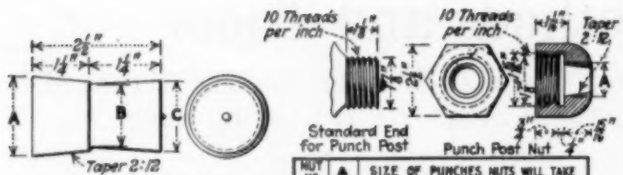


FIG. 2. CRANE FOR HANDLING LATHE CHUCKS

work, together with the fixtures for holding them in the presses, have been standardized and are all made in this shop, both for its own use and for distribution to other shops of the system. Fig. 4 is a chart containing drawings of the various parts and tables of the standard dimensions of the sizes in use.

The copper gaskets used under the cylinder heads of air pumps are beaded or corrugated on each side of the bolt holes and to make the joints steam-tight the beads must be squeezed down. When pumps are taken apart for repairs, the gaskets have to be rebeaded in order to make them serviceable for use again. After cleaning and annealing, the gaskets are rebeaded in the dies shown in Fig. 5. As both ends of the pump cylinders are not alike, two sets of dies are required. The gasket at the right has been rebeaded between the dies *A* and *B*, and the one at the left between the dies *B* and *C*. Fig. 6 shows the dies without the gaskets and gives a better view of their construction. Both mating dies have half round grooves cut in them at the beading lines and round steel wire is caulked into the grooves of one die for a "force." With a pair of gaskets in place and the dies closed as shown in Fig. 7, a few blows from a heavy sledge will rebead the gaskets and make them ready for service. The forged ring

FIG. 3. AN IMPROVED PULLEY



PUNCH NO.	SIZE OF PUNCH	SHANK NO.	A	B	C
E-1-b	3/16"	1	3/8"	1/8"	3/16"
E-2-b	1/4"	1	7/8"	3/16"	1/4"
E-3-b	5/16"	1	7/8"	1/4"	5/16"
E-4-b	3/8"	1	7/8"	5/16"	3/8"
E-5-b	7/16"	1	7/8"	3/8"	7/16"
E-6-b	1/2"	1	7/8"	7/16"	1/2"
E-7-b	9/16"	1	7/8"	1/2"	9/16"
E-8-b	5/8"	1	7/8"	9/16"	5/8"
E-9-b	11/16"	2	1 1/8"	5/8"	11/16"
E-10-b	3/4"	2	1 1/8"	3/4"	3/4"
E-11-b	13/16"	3	1 1/4"	3/4"	13/16"
E-12-b	7/8"	3	1 1/8"	13/16"	7/8"
E-13-b	15/16"	3	1 1/8"	7/8"	15/16"
E-14-b	1"	4	1 3/8"	15/16"	1"
E-15-b	1 1/16"	4	1 3/8"	1"	1 1/16"
E-16-b	1 1/8"	4	1 3/8"	1 1/16"	1 1/8"
E-17-b	1 3/16"	4	1 3/8"	1 1/8"	1 3/16"
E-18-b	1 1/4"	4	1 3/8"	1 1/16"	1 1/4"

NUT NO.	A	SIZE OF PUNCHES NUTS WILL TAKE
E-1	1"	For Punch No. E-1-b to E-8-b Inc.
E-2	1 1/4"	" " No. E-9-b to E-11-b Inc.
E-3	1 1/8"	" " No. E-12-b and E-13-b
E-4	1 1/8"	" " No. E-14-b to E-18-b Inc.

DIE NO.	A	USED WITH PUNCH NO.	DIE NO.	A	USED WITH PUNCH NO.
E-1-a	1/8"	E-1-b	E-10-a	5/8"	E-10-b
E-2-a	5/16"	E-2-b	E-11-a	7/8"	E-11-b
E-3-a	3/8"	E-3-b	E-12-a	7/8"	E-12-b
E-4-a	7/16"	E-4-b	E-13-a	1"	E-13-b
E-5-a	1/2"	E-5-b	E-14-a	1 1/8"	E-14-b
E-6-a	9/16"	E-6-b	E-15-a	1 1/8"	E-15-b
E-7-a	5/8"	E-7-b	E-16-a	1 1/8"	E-16-b
E-8-a	7/8"	E-8-b	E-17-a	1 1/4"	E-17-b
E-9-a	7/8"	E-9-b	E-18-a	1 1/4"	E-18-b

FIG. 4. STANDARDS FOR PUNCHES AND DIES

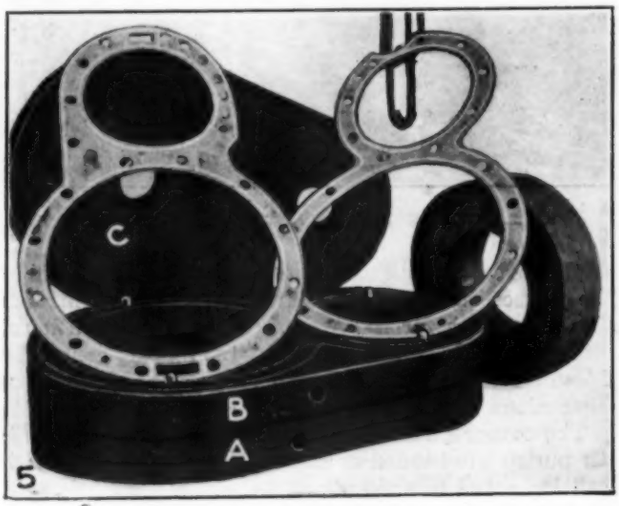
a very creditable job of gear cutting can be accomplished.

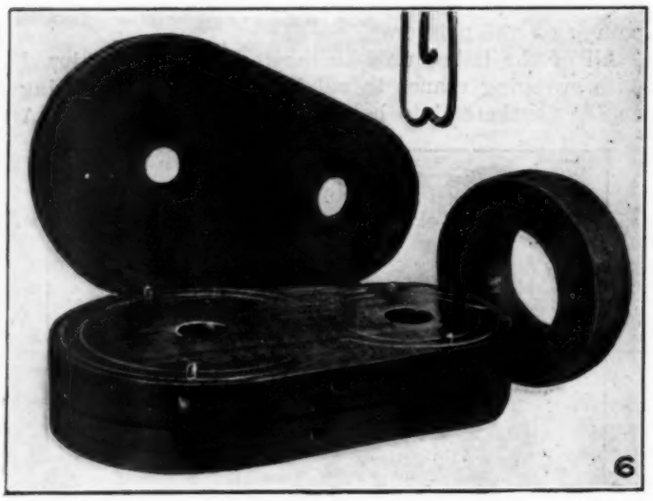
Grinding the holes in various locomotive parts is somewhat of an innovation in railroad repair work, but in this shop the Heald planetary grinding machine to be seen in Fig. 9 is in almost constant use.

While the horizontal boring machine shown in Fig. 10 was never intended for a portable machine, it is so used on the job to be seen in the illustration, where the holes for the swivel yoke in the frame of a Mallet compound locomotive are being rebored. The frame is leveled upon blocking and the boring mill put in place. The drive is by belt from a portable motor.

Machines converted to uses other than originally intended are shown in Figs. 11 and 12. The machine in Fig. 11 is an old Niles car-wheel boring machine. It has been fitted with pneumatic clamping devices and is now used for boring driving boxes.

The machine in Fig. 12 is a Bement cotter-drilling machine of the vintage of 1883, or thereabout, and has been converted for use in milling crosshead key slots in piston rods. The double-shanked milling cutters lean-

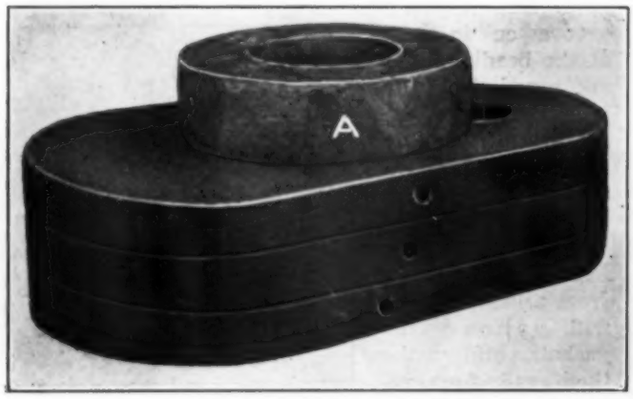




FIGS. 5 AND 6. DIES FOR BEADING AIR PUMP GASKETS

A shown on top of the dies is used as a buffer to take the blows of the sledge and prevent them from being battered.

In making repairs to the shop machinery it is occasionally necessary to do some gear cutting, so an indexing device has been put on one of the slotting machines as indicated in Fig. 8. With a tool of the proper shape ing against the piston rod in the machine will, however, be recognized as quite modern tools. It will be noticed that the clamping jaws *A* and *B* are of different lengths and hold the rod out of alignment. The purpose of this is to so mill the slot that one end will be at an angle to match the taper of the key. A hole for the insertion of the cutter is bored through the rod and the slot is



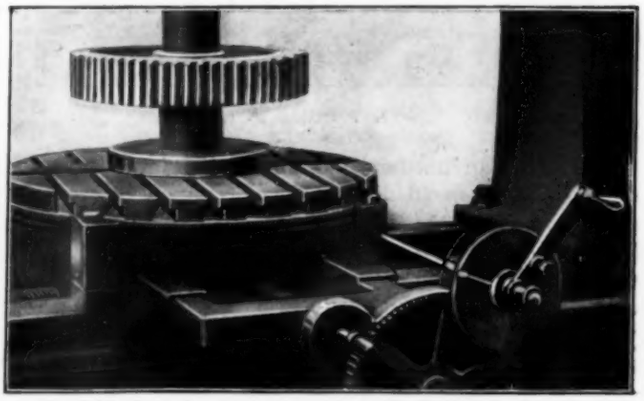


FIG. 7. BEADING DIES CLOSED. FIG. 8. INDEXING ARRANGEMENT ON SLOTTING MACHINE

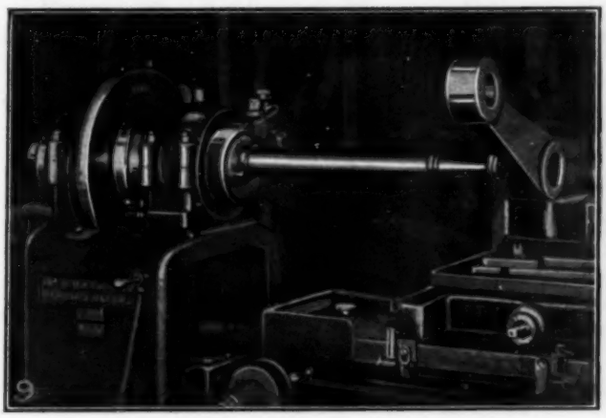


FIG. 9. GRINDING HOLES IN AN ECCENTRIC CRANK.

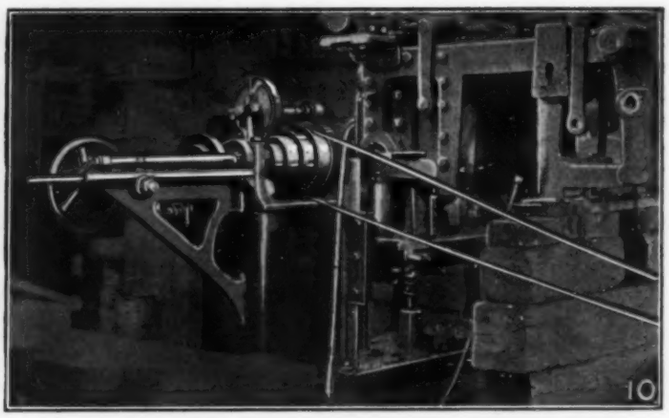


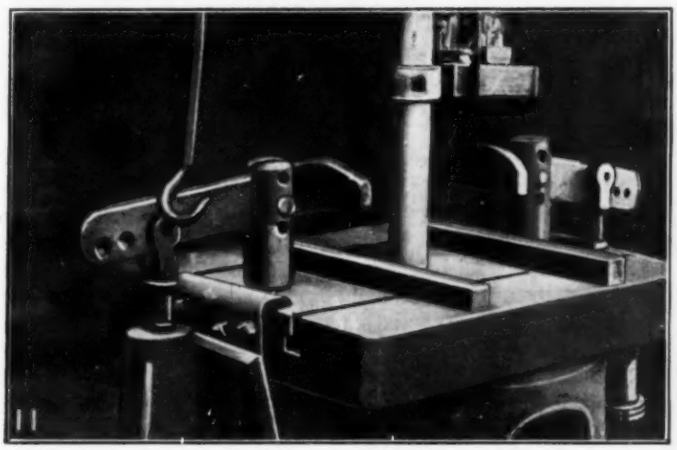
FIG. 10. BORING MILL CARRIED TO THE WORK

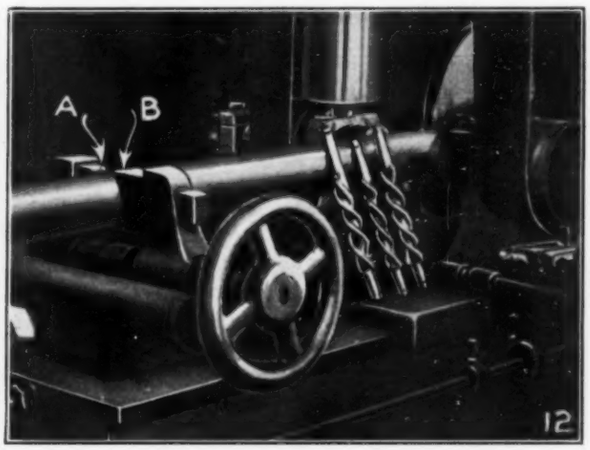
roughed out from the solid metal in one cut. A second cut with a finishing cutter completes the slot.

A special fixture for use in machining eccentric straps in a vertical boring mill is shown in Fig. 13. Screws set at a slight angle are used not only for positioning the work but for holding it and forcing it down to the bottom of the fixture as well.

For turning the outsides of eccentrics, the expanding fixture, Fig. 14, is used. The beveled edge of the washer *A*, pressing on the correspondingly beveled tops of the jaws, expands them in the hole of the eccentric, holding it firmly. The jaw *B* is slotted to match the keyway in the bore of the eccentric and when turning a key is inserted so that the throw will always be in a certain relation to the keyway. The fixture is mounted on a sub-base so that it can be moved into different positions for turning eccentrics having different amounts of throw. Holes for dowel pins at *C* and *D* in connection with a series of mating holes in the base allow the insertion of pins for predetermined positions.

Crown brasses are machined to fit the driving boxes in a Morton draw-cut shaper, using the fixture shown in Fig. 15. The brasses are held between the semicircular plates to be seen in the illustration. The mandrel is intermittently rotated through worm gearing driven from a ratchet so that the feed is circular. The adjust-





FIGS. 11 AND 12. OLD MACHINES CONVERTED TO NEW USES

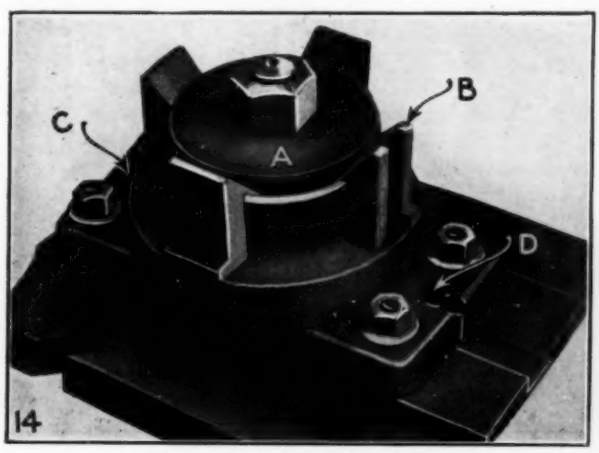


FIG. 14. FIXTURE FOR HOLDING ECCENTRICS.

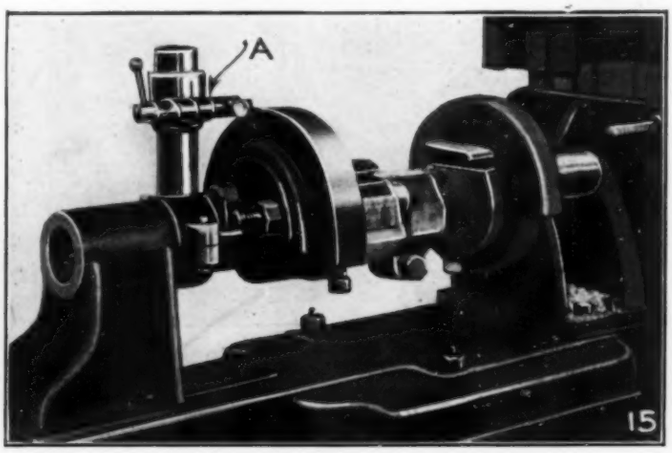


FIG. 15. FIXTURE FOR HOLDING CROWN BRASSES

able gage at *A* can be swung around the projecting end of the mandrel and can be used either in setting the work to a scribed line, or in setting the tool for the finishing cut. When not in use it is turned to the left so as not to interfere with either the tool or the work.

In laying out rough work, it is the general practice

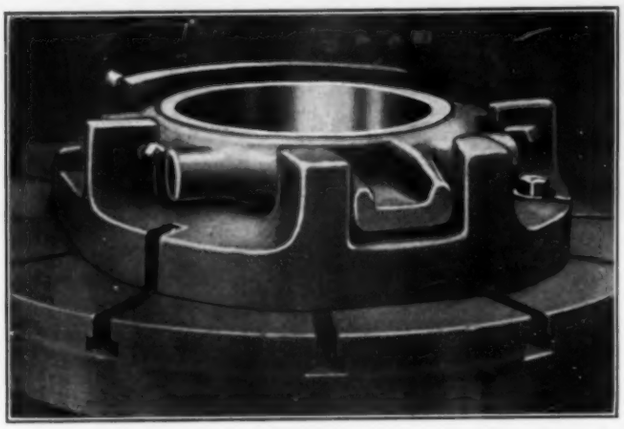


FIG. 13. FIXTURE FOR HOLDING ECCENTRIC STRAPS

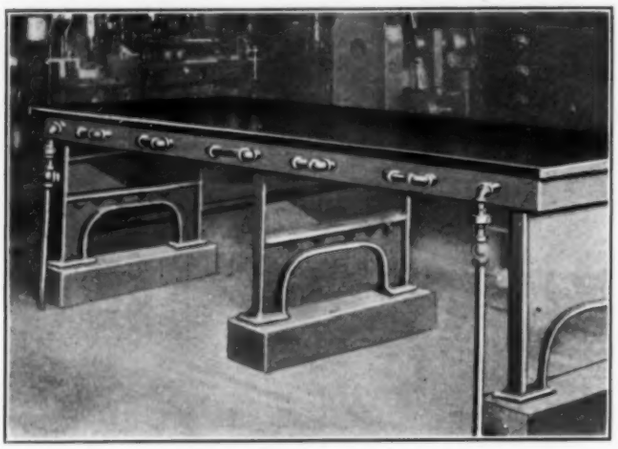


FIG. 16. STEAM-HEATED LAY-OUT TABLE

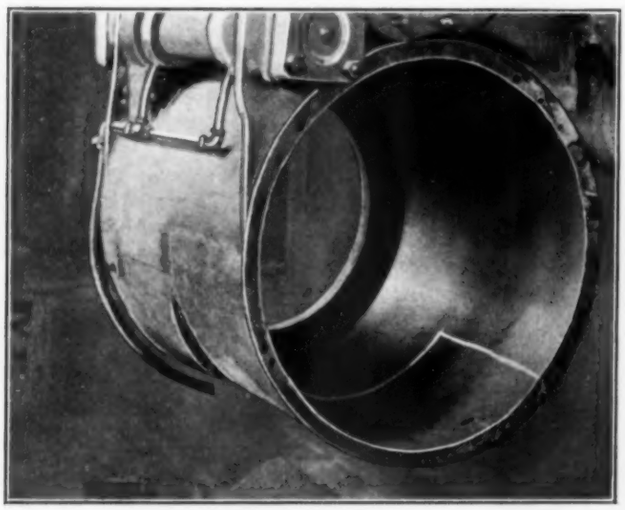


FIG. 17. A PATCHED CYLINDER

to rub chalk on the surface so that scribed lines and punch marks can be more plainly seen. In this shop a different method is used. The work is simply given a

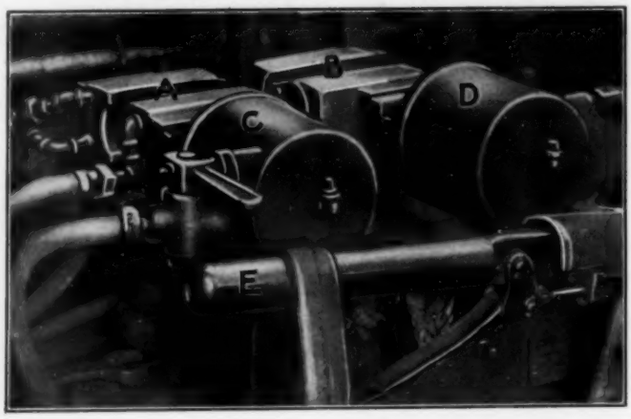


FIG. 18. MACHINE FOR SAFE ENDING FLUES

coat of ordinary whitewash and the laying-out tables, one of which is to be seen in Fig. 16, are steam-heated so that the work is warmed and the whitewash dries quickly.

Autogenous welding is used to a great extent in repairing broken parts, and Fig. 17 gives a good example of such work. The patched cylinder belongs on the front or low pressure end of a Mallet compound locomotive and is 40 in. in diameter. The patch can be plainly seen on the outside of the cylinder and its extent is indicated by the chalked lines on the interior.

Flues are safe ended by electric welding in the machine shown in Fig. 18. The flue is countersunk at the ends and is held at one end in the jaws at *A*. The piece to be welded on is beveled to fit the countersink in the flue and is held in the jaws at *B*. Both sets of jaws are closed by air pressure through pistons in the cylinders *C* and *D*. Downward pressure on the lever *E* brings both parts of the work together, establishing electrical contact and completing the weld. The strap looped over lever *E* forms a stirrup so that the lever can be operated by the welder's foot, allowing him the use of both hands. After the completion of the weld at one end, the flue is reversed and the operation repeated on the other end.

The foreman of the cab department, J. D. Mayo, has utilized a locomotive cab for his office, which may be seen in Fig. 20. The interior is nicely fitted up with a desk and a cabinet for blueprints, and presents a very cozy appearance

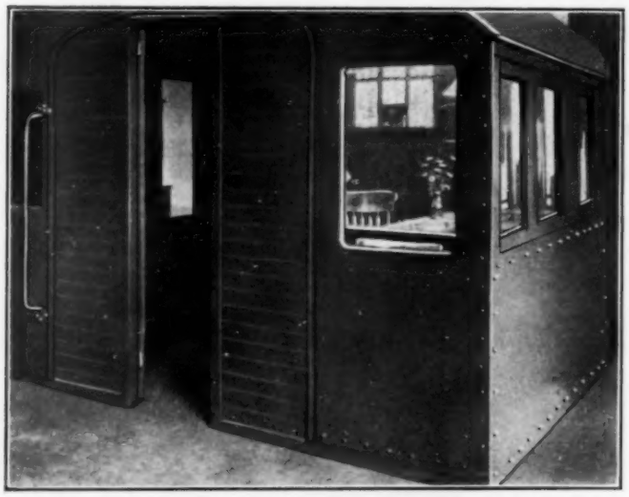


FIG. 20. CAB CONVERTED INTO AN OFFICE

Press Tools for a Flanged Cover

BY HERMAN SCHMID

The cover, Fig. 1, was made of 0.025-in. brass and produced in three operations at the rate of 1,000 to 1,200 per day. The first operation die, Fig. 2, for blanking, drawing and perforating has no unusual features, though care has to be taken that the perforating takes place at the last movement, as otherwise the holes would be drawn out of shape, especially the big one. The drawing and perforating plug *C* is fastened to the cast-iron die shoe *A* by two screws and two dowels (not shown). Blanking die *B* is seated in the die shoe and held by four screws and two dowels. *D* is a draw plate, resting on four pressure pins and held back by two screws. Punch *F* is seated in the cast-iron punch holder *E* and held by four

FIG. 1. THE FLANGED COVER

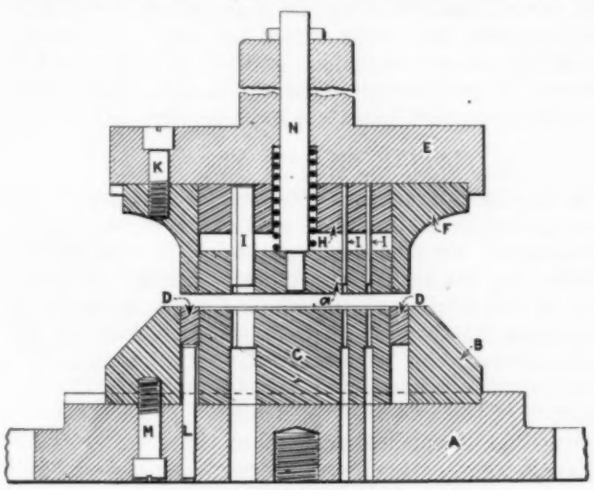


FIG. 2. FIRST OPERATION DIE

screws and two dowels. Punch plate *H* is fastened to the punch holder by two screws (not shown) and holds the perforating punches which are riveted over on the back side.

At *a* is a knockout and stripper plate, which is a sliding fit in punch *F* and on punches *I I*, and is held down by a light spring around *N*. The second operation die, Fig. 3, reverses the flange. The forming die *B* is fastened to the cast-iron shoe by four screws and two dowels. Hardened center plug *C* slides up and down in die *B*, rests on four pressure pins *H H* and is held by two screws *I I*. Pins *H H* in turn rest on a regular pressure pad (rubber or spring) which has to be very stiff. Punch *D* is seated and fastened to cast-iron punch holder *E* by two screws and one dowel. *F F* is a positive stripper. Punch *D* is 0.050 in. and recess in die *B*, 0.100 in. larger than plug *C*. The operation of this die is self-explanatory (see the work on the third operation die).

THE THIRD OPERATION

The third operation die, Fig. 4, flanges the cover and letters it. Die *C* is seated in the cast-iron die shoe *B* and fastened by four screws and two dowels. As this operation needs a very fair blow I found it safe to put a machine steel plate under the die shoe, giving at the same time more length and life to the four springs *F*.

Hardened center plugs *D* sliding in die *C* rest on springs *F* and is held back by two screws *E*. Observe that dimension *a* has to be the same as *b*, and *d* the same as *c*.

Hardened punch *H* which fits nicely in top of the so

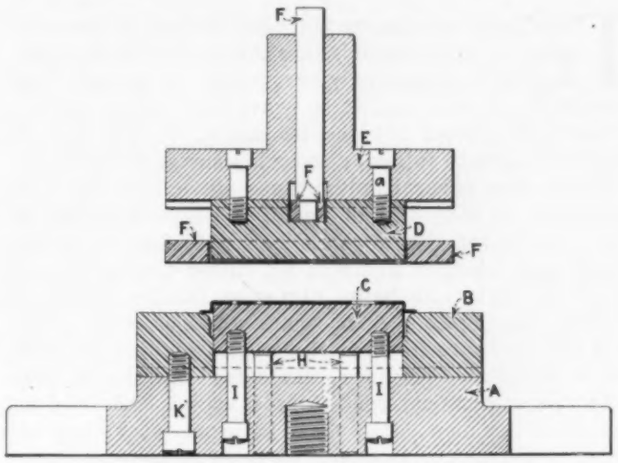


FIG. 3. SECOND OPERATION DIE

far advanced cover is seated and fastened to the cast-iron punch holder by two screws and one dowel and has in the center a lettering block or stamp *a* which in turn is held by a screw through the shank. Hardened punch plate *J* slides on punch *H* and works on four fairly stiff springs and is held back with four screws *O* which in turn are kept from loosening by setscrews *P*.

OPERATION ON THE DOWNSTROKE

When on the downstroke, the punch plate is forced back so that punch *H* enters the work and forces it, also plug *D*, downwards into the die. The long edge of the cover will butt against the recess in the die and by further pressure be forced out to a flange, for which there is room, half in die *C* and half in punch plate *T*. When the punch goes up, spring *F* will force the work out of the die. The springs acting on punch plate *J*

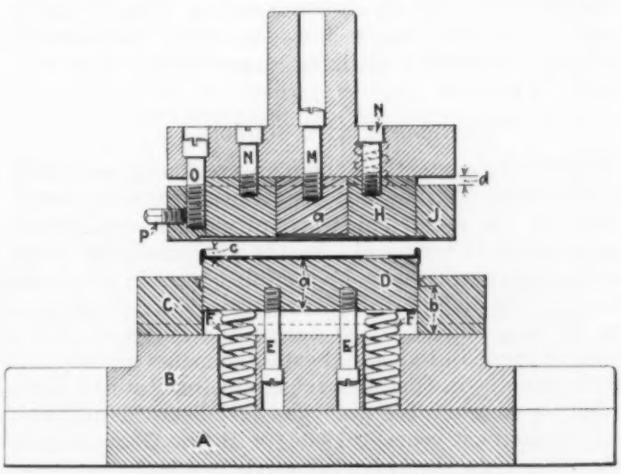


FIG. 4. THIRD OPERATION DIE

force it off of punch *H*, and as bottom of cover is now even it will be free on *D*, ready to be removed. This die works exceptionally well and smoothly and gives a clean impression for the lettering.

The Training of Workers in Manufacture

IV. Co-operative Employment of Engineering Students—Length of Shop Period—Courses on Technical Subjects—Advanced Shop and School Instruction

By J. V. L. MORRIS

THAT engineering students benefit by gaining some practical experience before completing their course has been increasingly recognized by educators in this field. Commonly, it is provided by the student securing whatever job is obtainable, in the line of work he hopes to follow, during his summer vacations.

There are several advantages advanced for this practice. It aids him in deciding whether he really has a taste for the work he had previously contemplated and whether he is at all suited physically and mentally to it. It helps him also in the choice of studies, during his final years of electives, which will best prepare him for the work to which he finds he is adapted. It gives him some experience both with the mechanical conditions involved and in dealing with the men with whom he must later earn his living, both rank and file and foremen and executives.

In the belief that this experience is of equal importance to the technical instruction of the school, the co-operative method of engineering school organization has been developed at the University of Cincinnati. By the plan the students are organized in pairs, and each pair arrange for employment in one of the co-operating corporations. Thus, there were eighteen employed in the National Cash Register plant, nine being at the plant while nine are studying at the university. Every two weeks the pairs shift their positions, those at the plants returning to the university and their alternates taking their places at work in the industry concerned. The courses on this basis are five years in length, the school work being given for eleven months of the year.

If there is a genuine co-operation on the part of the industry, so that the student is shifted through various departments and to such operations as will add to his equipment of "skills," he undoubtedly will later utilize the training in his engineering or supervisory work. The difference between this co-operative method and that of utilizing summers is, of course, chiefly in amount.

Co-operative Schools

Other developments of the plan are found, one being in the small engineering department recently established in the municipal University of Akron, where the practice is identical. In the University of Pittsburgh engineering school a modified form is practiced. The year is divided into four terms corresponding to the seasons, four of which during the four-year course must be spent in industrial establishments at practical employment. In the Massachusetts Institute of Technology a co-operative plan has just been inaugurated during the past year (1919-20) with the General Electric Co. This started with thirty students, and now provides for forty from each class during the junior, senior, and graduate years. The plan is arranged with alternate terms in the plant and at the school of thirteen and eleven weeks, respectively. In the new Harvard Engineering School the plan is to be tried in the junior year only.

As the plan seems to be somewhat slowly spreading, it is a pertinent question if it will ever become the general practice. The practical difficulties involved would seem to demand a negative reply. Cincinnati is at the center of a considerable number of large industrial plants, which could probably utilize all that might wish to follow an engineering course based upon the plan in that institution. The dean of the engineering school at Akron reported that there were openings in the local plants and engineering fields for several times the present number of students upon that basis in his school. There are, however, large and useful engineering schools to which no important industrial plants are accessible, that of Cornell University being a good example. In fact, it is by no means clear that the plan possesses sufficiently greater merits than that where the student-engineer spends his summer vacations and the year or two followering his graduation on such a basis as will insure the widest possible practical experience.

Length of Shop Period

The bi-weekly transfers from school to plant should be compared with the plan of alternating by terms. It is argued for the former that with the shorter periods the student more closely relates his shop work to his technical instruction than if the shop work extended through thirteen weeks. Also, by the shorter breaks, he is not so likely to lose the continuity of the educational subject-matter. The advantages of the two-week period over one week were, on the other hand, held to be that there was less lost motion in readjusting from school to shop and again from shop to school, if those readjustments occurred only thirteen times a year instead of the twenty-six, which would be required with alternating periods of one week only. From the administrative standpoint there seem to be obvious advantages in the three-month term for the alternating periods.

(1) It permits the instruction of the co-operative students in the same classes as the regular full-time students, as it is fairly easy to reorganize the instruction so as to divide the academic year into three terms instead of two.

(2) Students may be placed at employment several hundred miles or more from the educational institution. The desirability of this has been pointed out in connection with schools not located with suitable plants immediately contiguous. In railroad and mining employment the desirability is equally evident. A mining school located, let us say, in New York City might find it desirable to place some of its students for practice in Canada, Upper Michigan, or Montana. Railroads, which should offer a profitable field for experience to civil, mechanical, and, doubtless, soon for electrical engineers, would hesitate to guarantee employment within one hundred miles of the engineering school, a distance limitation which would seem desirable with the bi-weekly schedule.

(3) The term period obviates the necessity for ab-

solute pairing, which is always an awkward matter to administer. One member of a pair may show ready adaptability to the work and become sufficiently experienced to warrant a generous increase in remuneration, while the work of his alternate would only warrant the payment of the minimum wage scale. Again, an alternate may withdraw, making it necessary to pair an experienced man with a thoroughly green man.

(4) Three months is a reasonably satisfactory period for a working unit, as well as for a teaching unit. It is the period worked out as satisfactory for teaching milling machine operation under intensive training, and for assignment to the electrical winding department for students in the technical training course. It would probably be equally suitable for assignment as chain-man or assistant transit-man for a civil engineer.

Co-ordinating the Work

Moreover, where a considerable number of students are employed in the same plant or on the same engineering undertaking, it would probably be possible to get them together occasionally, perhaps one or two evenings a week, for co-ordination purposes; as is the case in the General Electric plant for the Institute of Technology students. This would probably be possible in plants employing ten or more students, or where a like number were employed in a given locality or city.

If the plant had a man capable of handling the matter in its educational department (presuming that it possesses such a department), it would probably be in its interest to take care of the matter itself, or at least in co-operation with the educational institution. It is found that, without this linking up of the student with the plant's organization, the work is, in general, looked upon as a wholly temporary arrangement to be terminated at graduation. Of course, the student should be free to leave, if he chooses, when he desires; but men well suited to the corporation's work might thus be saved as valuable additions to its personnel. As at present conducted, the acceptance of co-operative students seems too often to be considered as purely a concession to the university and to the students employed, with no accruing benefits to the corporation.

The conclusion of this study is, then, that if co-operative instruction is to be more generally adopted by educational institutions of university grade, the term rather than the bi-weekly arrangements will be better suited to the larger number of institutions. This does not, however, presume that the Cincinnati plan is not working well under the conditions there prevailing.

Training Engineers in the Plant

For an American corporation to provide both practical experience and applied technical instruction for young men selected to recruit the engineering force, is not as common as apprenticeship; but, still, it is a very frequent practice and one which seems on the increase.

Those to whom the opportunity is offered are ordinarily high-school graduates and preferably those who have had a technical course. As such they have had, under more favorable conditions, some training in drafting, a year or more of instruction in each of the two sciences most useful for the purpose, physics and chemistry, and probably a four-year course of mathematics. It is also to be expected that they have had at least some rudimentary shop practice. They are ordinarily, then, about eighteen years of age and are willing to start at ten to fifteen dollars a week, which is probably all their production will warrant at the beginning. It should be recognized that they consider the training provided a large part of their remuneration. The usual course is three years.

In one plant these young men are indentured in the same manner as are the trade apprentices, and start with the latter for a year to a year and a half in the apprentice training shop to obtain a varied experience at regular machine production. Some are enrolled to become draftsmen, others to become electrical testers; and there is a course scheduled for technical clerks, but apparently this is not much developed.

Draftsmen, in particular, should benefit by the machine shop experience, as the utility of a tool or machine design depends in part on its practicality from the standpoint of economy and production. After the initial experience in the machine-shop training department, the draftsmen then enter the drawing office; and the testers, for the remainder of their three-year course, shift by three- to six-month periods in a regular schedule through the winding department, the drafting office, and the assembling and testing departments for electrical machinery.

In what is called the engineering school, all receive about an hour and a half of instruction each day in mathematics, mechanics, electricity, machine and dynamo design, chemistry and metallurgy, drafting and business English. The success of the course is attested by the number of graduates who have become engineers in their fields, tool and machine designers, testers, draftsmen, or have been selected for supervisory positions.

Shop Technical Training

Another electrical instrument company has recently instituted in its engineering office a somewhat similar course for the large number of assistants which can there be utilized. An electrical cable company has organized during the past year a class among its high-school graduates and others with sufficient preparation, for a technical course. One electrical manufacturing company has maintained for its employees a voluntary evening school in the fundamental principles of engineering, during the past eighteen years. That of the nearly two hundred graduates, about one-half should already have reached responsible technical or supervisory positions suggests the value of the course.

Two companies are working out educational programs on the principle of alternative weeks at instruction in a company school and at production. One is in a shipyard for national draftsmen, the other in an important manufacturing plant, as a means for recruiting the design, sales and supervisory staffs. It is, however, at least open to question if this alternative-week plan, where the company furnishes both the instruction and productive experience, will ever develop to any degree. In the shipyard, for example, might it not be more economical, from the learning standpoint, to have the future nautical draftsmen go into the mold loft or pattern shop for a predetermined period, rather than attempt to alternate between shop and drafting room?

A considerable number of companies provide more or less formal instruction for their draftsmen, as it is readily recognized that a man's value in that field depends largely on his technical and practical knowledge. The latter can, of course, best be obtained by a temporary shift to regular production, and preferably under such conditions as will permit the greatest possible variety of useful experiences in the limited time which can be thus utilized. This would suggest the use of the shop training department, if available.

The Goodyear Tire and Rubber Co. has organized its provision of supplementary instruction as an Industrial University. While the instruction is for all types of workers, some of the instruction is arranged to facilitate the promotion of non-technical men to such positions as are ordinarily recruited from the engineering colleges. The Ford Motor Co., has just announced a Technical Institute, which will confer degrees on those who complete the courses to be provided in this field.

Technical Schools

It is difficult to estimate the number now under organized training on this basis; but it is safe to say that it is but a drop to a bucketful compared to the number who are pursuing their technical training in the schools of technology and in engineering colleges. Probably, also, the number is far short of the worthy graduates each year coming from the technical high schools who would gladly avail themselves of the opportunity, were it more generally offered.

It is a pertinent question whether a company can thus afford to provide the supplementary technical instruction and subject its production departments to the inconvenience of being troubled to train for a short period a young man who will not be a permanent acquistion to its working force. Experience seems to answer in the affirmative. The young man who, at the start, is more concerned with getting a wide experience than a large salary will willingly work for much less, if he has provided for him a well laid out training program; and he can probably earn at varied production the relatively small amount paid him.

As regards the draftsmen, it should be recognized that design for each industry is to a considerable degree particularized. The regular technical school, day or evening, in general only provides the fundamental training, after which there is often a considerable amount belonging to each individual industry which can best be learned therein. While it is possible that the better men will obtain this information on their own initiative, the special instruction helps to insure this result.

In considering the utilization of the plan in a drafting office, it should, however, be borne in mind that in many plants there is wide fluctuation in the size of the personnel. Usually there will be a small permanent force, which at times will be greatly augmented to get out some new designs or to provide for an expansion of business. Usually this demands expedition which will only warrant employment of draughtsmen already competent. Any scheme of systematic training is chiefly useful, then, in recruiting the permanent personnel, which would presume a department of some size in a plant warranting a large engineering office where design is a major interest.

Corporation Technical Night School

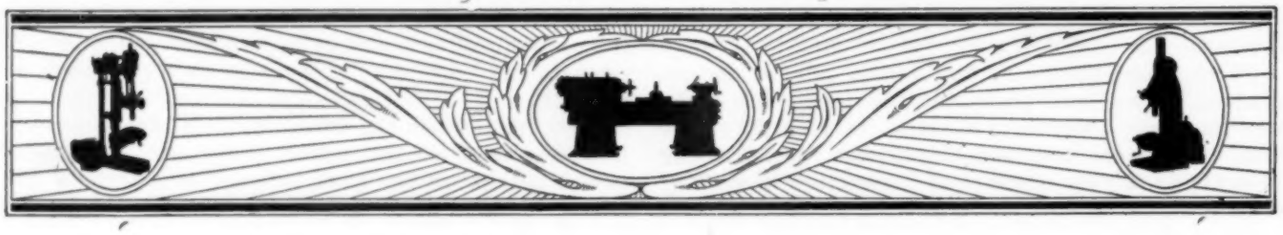
The advantages of the technical night school for future engineers under company auspices have already been suggested. The faculty can be readily recruited from the company's engineering staff, the instruction can be adjusted more readily to suit the company's products and requirements for future promotions, and such a school can probably be made to develop a company *esprit de corps*.

That we do find company technical night schools does not, of course, warrant the assumption that there is no need of engineering university extension or of the institutes and public evening technical schools, which in some cities have proved their large usefulness. As a matter of fact, a major part of the technical instruction in this field is now provided by these institutions, and will doubtless in the future in increasing measure continue to be so provided.

One should not ignore, also, the possible contribution of correspondence instruction in this field of supplementation for work in the technical departments. The high-school graduate, it may be expected, has sufficient educational background to assimilate what is clearly presented in a book and, if he has sufficient application to stick to a course, he should benefit thereby. It doubtless assists if some one in his department is delegated to help him over difficulties, offer him encouragement, and provide recognition for accomplishment. This is a possible function of one delegated by the company's education department.

The through development of a corporation school in this field will probably be limited to the larger corporations and in particular to such occupations as require large units of instruction peculiar to the industry, or where public or endowed educational institutions are undeveloped or unavailable. Isolated plants belong in particular to this category.

The shop experience of trade apprenticeship coupled with the supplementary instruction of drafting mechanics given in the better apprentice schools, is clearly excellent preparation for work in design. This has led in some plants to the practice of recruiting the small drafting departments from the trade apprentices who showed an inclination to enter that field. This is probably a commendable arrangement, if the small number of draftsmen required does not warrant organizing a separate training department for that field; but it is believed that, in general, the preliminary education presupposed by high-school graduation is a desirable prerequisite to drafting.

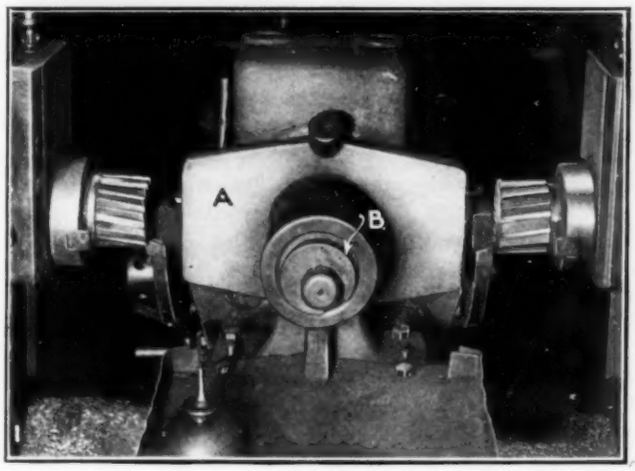


Machining an Unusual Crankcase

Tools and Fixtures for Machining a Crankcase of Unusual Design—Duplex Boring Head Used on Drilling Machine—An Extension Milling Device

BY FRED H. COLVIN
Editor, AMERICAN MACHINIST

EVERY automobile driver who tours to any extent knows the Reo Speed Wagon. It usually passes him on the road when some farmer or truckman, who drives one, is in a hurry. Just where it gets its speed is not clear, but it has a motor with a crankcase of such unusual design as to make the tools and fixtures for its manufacture of special interest.



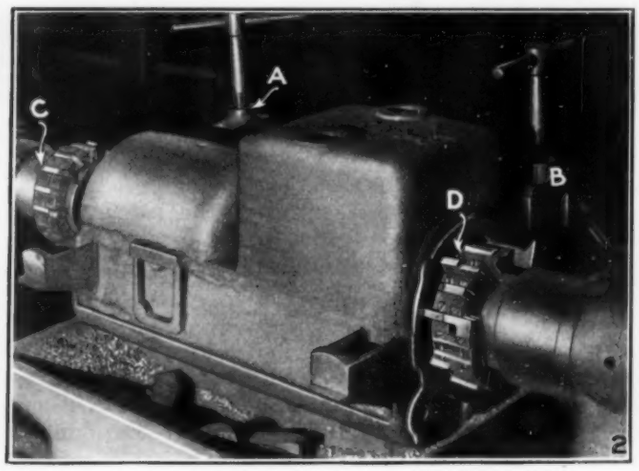
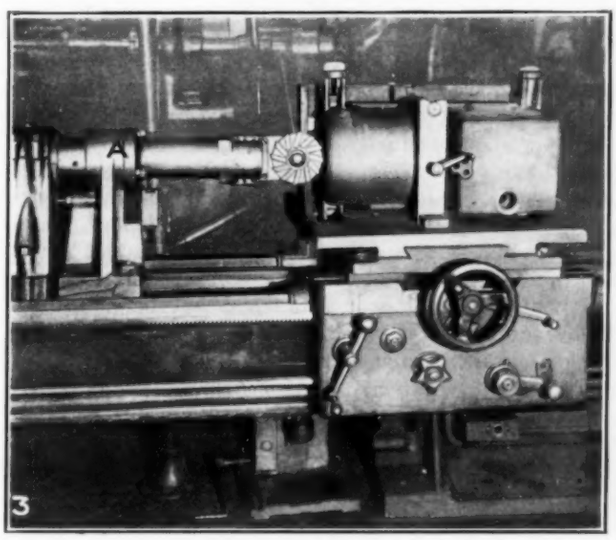


FIG. 1. MILLING THE SIDE ARMS. FIG. 2. BORING BOTH ENDS

After snagging, chipping and filing, the supporting arms are milled, using the fixture and milling cutters shown in Fig, 1. The case is held against the angle plate *A*, an open washer *B* making it easy to save time in handling.

Locating by the arms which have just been milled, the case is held face down on the fixture shown in Fig. 2. The locating and clamping are done on the back side as at *A* and *B*. The special boring heads *C* and *D* both bore and chamfer the hole, the chamfering being done by a special blade which can be seen in each cutter. The design of the cutter head is worthy of study as an example of successful practice. The boring is followed by boring and reaming the camshaft hole, milling the hand hole and magneto pad, drilling, counterboring and facing the oil-pipe return hole and reaming the valve-stem guide holes.

The center bearing is cast in the crankcase and has to be faced with a milling cutter which goes in from the end, as shown in Fig. 3. This device is rigged up on an engine lathe, the fixture being supported at *A*, the lathe spindle driving the milling cutter by an internal shaft and bevel gears. The case is mounted in a special fixture on the lathe carriage and is fed in past the cutter which faces the bearing ready for the cap.



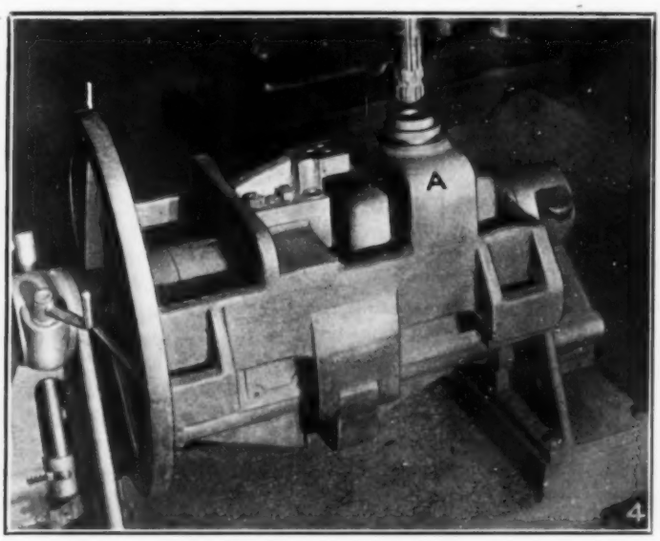


FIG. 3. MILLING FACE OF MAIN BEARING. FIG. 4. ROLL-OVER DRILLING FIXTURE

The drilling is done in the trunnion fixture, Fig. 4. The reamer shown at work is piloted in the heavy

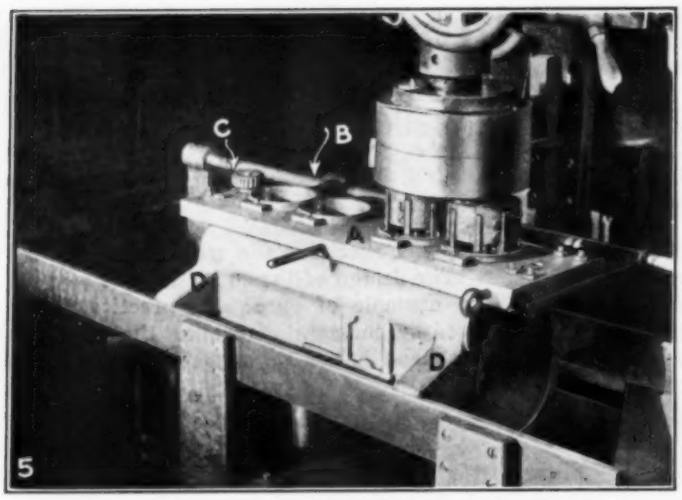


FIG. 5. BORING FOR PISTON CLEARANCE. FIG. 6. THE MOTOR TEST ROOM

arm *A*. This fixture is used for drilling fifteen holes in various positions, the control of the indexing pin and the method of locking the fixture in any position being the same as previously illustrated.

The Piston Clearance

The piston clearance and cylinder location are next bored with a special two-spindle boring head on a Baker drilling machine, Fig. 5. These holes position the cylinders, which are cast in pairs. The guiding plate *A* is hinged on the bar *B* so that it can be readily swung up out of the way when changing cases. The knurled knob *C* locks the plate on the crankcase. The whole thing is moved along for boring the next two holes. The supporting arms *D*, resting on the steel ways, guide the crankcase as it is moved along and also locate it sidewise with the drilling and boring spindles.

A number of the completed motors are shown in the test room in Fig. 6. Here they can be first run in either by electric motors or under their own power and use the motors as generators to give them a load. The test stands are very complete and compact.

Romances of Metal Working—Two Famous Armorers

By H. H. Manchester

In the 15th Century the two great schools of armor making were the Italian and the German, which had by this time surpassed in quantity, if not in quality, the famous Toledo blades of Spain.

In Italy the armorers were located in all of the principal cities, with those of Milan, Florence, and Venice perhaps the most famous. A representative armorer of Venice was Vittore Camelio, who also developed a rather important step in metal working.

He lived in the latter half of the 15th Century, and was noted for his light steel armor of a very high temper, as well as for the elasticity and indestructibility of his swords.

Camelio was not only an armorer, but a medal maker and an engraver. One day, so the legend runs, he used one of his swords to slice off a bar of gold which had been sent him for medals. This was done so easily that he realized more than ever the fact that he could produce steel which would cut the other metals. From this idea, he developed a steel die, which he used at first to cut out the blanks for medals, and later, it is said, to stamp the face of a coin. At any rate, the senate of Venice in 1509 gave him a patent for this device for five years, which is comparatively good proof that there is much truth in the story.

A fair representative of the German school of armor making was Conrad Seusenhofer, who lived in the last of the 15th and the first of the 16th Century.

In 1504 we find him enlarging his workships at Innsbruck with money advanced from the government, but later we find that this was to be deducted from his pay.

He developed the fluted style of armor, which was for some years the height of fashion, and evolved a number of special tools to produce this. Another tool of importance which he is credited with improving, is the heavy shears which could cut thin plates of iron before they were hardened. The shears were fastened at an angle in a huge wooden block.

He developed several new methods of armor plate construction, but these were not at all in favor with Maximillian, the emperor, who said to him: "Make my armor only in accordance with my instructons, for it is I, not you, who must wear it."

In 1511 Seusenhofer complained that the mine master, Kugler, was sending him poorer metal, and suggested that the armor plate from it be called Milanese, which indicates that he thought the Innsbruck steel better than the Italian. It also shows that at that time the quality of the steel produced could not be altered at will by the smith, but depended largely on the nature of the iron with which he had to work.

One of Seusenhofer's suits of armor was presented by Maximillian to Henry VIII of England, and still hangs in the tower.

The armorers of the time were always having trouble collecting the pay for their work, and frequently the only method of assuring it, was not to deliver the armor until paid for. Seusenhofer was apparently using this method to collect from Maximillian, or his government, during one of the wars of the period. This finally led to there being a shortage of armor, whereupon Maximillian in wrath sent word that if the armor were not forthcoming that the armor makers would be put in the front rank without armor, so that they could appreciate for themselves how it felt to fight without proper protection.

Grinding and Testing Level Vials

Grinding Tubes to Curves of Long Radii—Formula for Curves To Produce Determined Sensitiveness—Automatic Machine for Grinding Level Vials

By GEORGE N. SAEGMULLER
Vice-president, Bausch & Lomb Optical Co.

AT ONE period cylindrical tubes of glass were selected for the purpose of being converted into levels, without further preparation than being hermetically sealed after the alcohol had been enclosed in the proper quantity to form a suitable bubble; and frequently some one face of the glass was found on trial to be so uniform in curvature as to form quite a good level.

The majority of levels thus made, however, are very inferior and can be used only where accuracy is not required. All the better levels are ground on the inside to a curve, and it is obvious that the greater the radius of the curve the more sensitive is the level. Thus, if we give the curve a radius of about 30 ft. the bubble will run about $\frac{1}{10}$ in. for an elevation of *one minute of arc*. But if we give the curve a radius of about 1,700 ft. the bubble will run about $\frac{1}{10}$ in. for an elevation of *one second of arc*.

The sensitiveness of a level is generally determined by an instrument called the "level-trier," which is a grooved metal bar, furnished with two feet at one end and a micrometer screw with graduated head at the other. Knowing the length of this bar and the pitch of the screw, it is an easy matter to find the value "in arc" corresponding to one division of the divided head.

By placing the level to be tested on the grooved bar, the turning of the screw will show whether equal quantities of elevation will produce equal spaces of run in the bubble, and at the same time show how many inches on the scale are equal to one minute of arc. This value being known, the radius of the curve to which the interior face of the level has been ground, is easily determined.

Let r denote the radius of the curve, 21,600 being the number of minutes contained in the circumference of the scale, d the distance in inches and parts run over by the bubble in one minute of elevation, and $2\pi = 6.2832$ being the measure of the circumference to the radius 1, then

$$r = \frac{21{,}600\, d}{6.2832}$$

For instance, take a level in which we find $d = \frac{1}{10}$ in., then the radius of curvature will be

$$\frac{21{,}600 \times 0.1}{6.2832} = 343 \text{ in.} = 28.6 \text{ ft.}$$

In like manner, when the radius of curvature is known, the value of the scale of any level may be determined by transforming the above formula into

$$d = \frac{6.2832\, r}{21{,}600}$$

It is to be observed, however, that owing to the adhesion and friction of the fluid the values of the curvatures thus found are always a trifle smaller than they are in reality.

One way of giving the requisite curve to the glass tubes which have been selected as suitable for levels, is by grinding the inner surface by means of emery and water on a metal mandrel to which the required curve has been given. Another way is by means of a metal cylinder used with emery and water, on which the level tube is moved backward and forward. The degree of curvature obtained in this operation will depend on the relative lengths of the cylinder and the glass tube. If these are of the same length and the movement is continued throughout the whole length of the tube, the curve thus obtained will generally be too great, but working with a shorter cylinder will increase the concavity and lessen the curve. As in all hand operations, experience is required to turn out a good level at reasonable cost, especially levels of great sensitiveness and

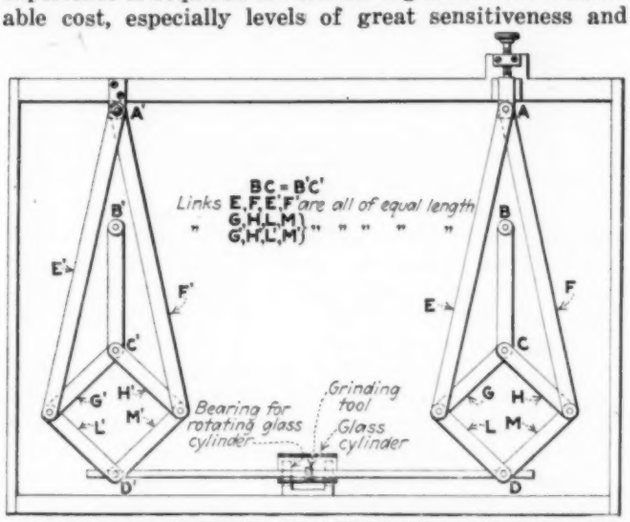


DIAGRAM OF MOTIONS OF AUTOMATIC MACHINE FOR GRINDING LEVEL VIALS

uniformity in curvature throughout the entire length, as for instance, levels used in astronomical instruments, where an elevation of one second of arc must be clearly shown by the movement of the bubble, and the amount of this movement must be alike throughout the entire length of the scale.

The writer has constructed a machine which will grind accurate levels automatically. The underlying principle of this machine is the "Peaucellier" cell, shown in the annexed schematic sketch.

If the distances AB and BC are equal, the movement of the lower point D (all things being as shown in the sketch) will be in a *perfect straight line*. But if the distance AB is greater or less than BC the point D describes a curve.

Two such "cells" being united by the grinding bar (as shown in the sketch), the grinding tool moves forward and backward in the desired curve, while the level turns on its axis, to a small extent, at every movement. Thus the entire interior surface of the level is ground out barrel shaped, which, for reversion levels, used in engineering instruments, is absolutely necessary.

The greatest difficulty after grinding the interior of the level is encountered in sealing the ends without deforming the curve. This requires a great deal of experience, as, if heated too much, a level truly ground from end to end becomes deformed at the ends.

Building Up Teaching Ability in Foremen

Continuing the Discussion of Foreman Training—What to Teach and How Far to Go—the Importance of Patience—Some Examples

By D. J. MAC DONALD

THE first essential to success in teaching, as in anything else, is effective planning. I care not how much a person may know nor how clever he may be, the fact remains that unless he faithfully makes his plans, thoroughly analyzes his problem and endeavors to provide for all contingencies, he can no more hope to qualify as a success in teaching than he could in business if he did not observe this order of procedure. Trusting to the inspiration of the moment to carry one through may have worked at one time but not any more.

Our experience in trying to get foremen to accept this idea of planning the teaching job carefully, of thinking a thing entirely through before trying to teach another that thing, is about what might have been expected in view of what has been pointed out heretofore regarding the psychology of foremen. Due to the fact that his training has been largely in the school of hard knocks, and to the additional fact that he has an almost instinctive aversion to theory, it is next to impossible for him to attach adequate significance to careful analysis. Moreover, it is only with extreme reluctance and very slowly that he abandons the position that knowing how to do a thing well is equivalent to knowing how to teach another to do that thing. And it must be recognized that from his angle of vision his position seems rather tenable. For is there not a close analogy between the situation in which our foreman finds himself and that of young persons who are being cajoled and threatened into using better English? Is not the outstanding fact and obstacle in each case that what both have been doing heretofore apparently met every requirement?

What thinking the matter entirely through signifies in the field of teaching may be illustrated as follows: Suppose, for example, that the foreman's job is to teach a green hand in patternmaking what draft is, or in other words, why he needs to allow for it, how he should allow for it, etc. The questions which such a foreman must face and answer at once are:

1. What are the facts which I must get over to this man in order that he will know what I wish him to know about draft?

2. How much do I wish him to know about draft at present?

3. What are the various possible ways of getting this information over to him?

4. Which of these various ways will be best for this occasion?

Now when he comes back, as he must to question number one, he will find, or at least should find, that he knows much more about draft than it would be wise to try to put over to the new man during the first teaching period; and that as a result he must, through process of elimination, reduce the total number of possible facts in his possession to those which will meet the needs of the present situation. Putting the same thought in other words, he must not only consider his total knowledge on draft but he must also, following a careful examination of this knowledge, select only those facts which will serve his purpose at this time. It goes without saying that he must have thoroughly analyzed the immediate problem before he can make any decisions regarding what facts to retain and what to reject.

I can illustrate this by referring to the common experience of giving a stranger directions regarding how to reach a certain place. Usually the informant knows more than one way of directing the inquirer. What must he do therefore? If he is to qualify as a good informant, must he not think about like this and then act accordingly? "There are four possible sets of directions I might give to this person. But he is a total stranger and I must therefore give him the information needed in the simplest possible form. It would be better, for example, to direct him to take a slightly longer route than to confuse him by means of such additional statements as would be necessary for directing him to a shorter route, etc. But whichever way I direct him to go," he would reason, "I must, if possible, give my directions correctly the first time. I must be sure that they are understood correctly, and I must avoid irrelevant statements." While the foregoing illustration is very simple in character it nevertheless contains all of the elements which enter into any situation where planning is essential. Accordingly whether the foreman faces a production job or a teaching job his manner of procedure must be similar to the above. Immediately below appears a thorough analysis of a teaching job which is more or less familiar to all shop men. Note (a) definite determination of the end in view, (b) the selection of all ideas which might be useful, and (c) the separation of the essential from the nonessential.

IDEAS CONNECTED WITH TEACHING HOW TO USE A HAND SAW

Essential Ideas	Basic Idea	Non-Essential Ideas
1. Piece of wood must be held in firm position. 2. Hold saw at proper angle to insure ease in operation. 3. Hold handle of saw loosely rather than tightly. 4. To start saw: Place end of free thumb at point where cut is to be made, hold side of saw close to end of thumb, and push saw down sharply and firmly until cut is well started. 5. Draw saw up and down with easy motion. 6. Exert pressure only on downward stroke.	Handle saw in such a way that satisfactory results come quickly and easily.	1. Information regarding the making of saws. 2. The various kinds and makes of saws. 3. Different qualities of saws. 4. Various uses to which saws are or may be put. 5. How to file saws so as to meet the demands of different kinds of woods. 6. Pointers on how to care for saws properly.

Assuming that effective planning embraces only what has been covered so far, an unwarranted assumption I grant, the next essential is that of determining the exact order of procedure in teaching, the sequence in which the various ideas, illustrations, comments, etc., which constitute the entire teaching job shall be presented. The implication is that there is one best way to teach a worker how to turn a taper or to inspect a casting the same as there is one best way to turn a taper or inspect a casting. And to a large degree this is true especially if the job is not simple in character. Let us look for a moment at the job of inspecting a casting. To complete such a job one must, among other things, check all dimensions, examine the finish of all surfaces unless otherwise instructed, note carefully the consistency of the casting as revealed by the presence or

absence of blowholes, etc. The question which at once arises, or at least should arise, after the various operations necessary to accomplish the work have been listed is: What is the best order for carrying through these necessary inspection operations? Thus, should the casting be inspected first for finish, second for dimensions, third for blowholes, etc.—or should the order be reversed? Then the question of standards enters in. Need equal care, for example, be exercised in all cases where dimensions or finish are under consideration, or shall practically no attention be given in some instances and much in others? It is unnecessary to point out such an obvious fact as that each job would have to be analyzed and treated in accordance with what the analysis revealed, this despite the fact that the similarities in operations in different jobs would doubtless far outnumber the differences.

Real Test of Teaching Ability

It is in connection with the above step, i.e., putting ideas over to the other fellow in proper sequence and with proper emphasis, that one of the true tests of teaching ability enters. Accordingly it is here that the teacher-trainer must do careful work with foremen. It will be found that the average foreman can easily be taught to analyze jobs well enough to enable him to prepare standard instruction sheets indicating in proper order the steps which make up the production job; but that he finds difficulty in analyzing these steps from the angle of learning difficulties. To illustrate: Let us assume that in making a certain type of screw twelve distinct operations are required. For convenience let us number these operations in the order they are performed, one, two, three, four, etc. Now let us suppose that the operations known as grinding the tool and setting it properly, operations four and five, are the most difficult in the list and that operation two, sinking the centers, is one of the easiest. We then have a situation somewhat as follows: The foreman must face the fact that getting ideas four and five over is much more difficult than getting idea two over and must organize his forces accordingly. He may find that a more thorough demonstration of operation four than of operation two will meet the needs or that several repetitions of the former may be necessary. Again he may find that his explanation of the former must be more elaborate. But whatever his analysis reveals it is incumbent upon him, as stated above, to make such preparation as necessary for putting his ideas across.

Since this task of recognizing learning difficulties, determining the learning difficulty order, and acting in accordance therewith is so difficult for foremen it may be well to mention the most important factors entering in. First among these is the attitude of the learner's mind toward the job as a whole or toward some particular operation in the job. Has his experience been such as to help him to an easy understanding of the task or an easy mastery of the necessary movements? Or is the opposite true? A second determinant is the success with which the teacher explains necessary details or demonstrates how to do certain operations, etc. All too often this is not included among the difficulties which the learner encounters. But to omit it is a great mistake for so far as the learner is concerned the teacher must be considered a part of the entire process. Third on the list may be mentioned the standards which must be met, or, in other words, the degree of accuracy, neatness, speed, etc., necessary. It is easy to see that a high standard or quality of work would exclude many, while the same in quantity would shut out another large group. It might be put this way: the greater the degree of accuracy, neatness or speed required the more difficult the job or the special operation in the job. A fourth one is the complexity of the job. By this is meant the number of different ideas which go to make up the entire job together with the difficulty connected with mastering each element or phase of the job. Thus, learning to run a gasoline engine is easier than learning to run a traction or railway engine, etc. As a fifth and final one I mention the degree of hazard involved in the job. No more confusing factor is known, when one is learning a new piece of work, than fear that a wrong lever will be moved or an oil cup missed or something else equally vital forgotten. Necessary caution ever acts as a deterrent when speed is the objective; and to a less degree this is true when accuracy is desired.

In the preceding paragraphs several important principles have been pointed out, namely, the necessity of thoroughly analyzing the lesson to be put over in order to determine, first, the exact object or end in view, second, the various ideas which are essential to putting this over properly, third, the approximate if not the exact order in which these ideas are to be presented during the teaching period, and fourth, the determination of the learning difficulty order. While it is granted that these principles constitute the backbone of teaching it is easily conceivable that a person might faithfully observe all of these and yet be a mediocre or even a poor teacher. It is because of this possibility that I call attention to other fundamentals that must be gotten over in a course of this kind.

The first of these has reference to the method of helping the learner. It is almost universally true that teachers, especially untrained or poorly trained ones, sin on the side of telling their pupils too much rather than too little. To do this continuously cannot result otherwise than to develop a spirit of dependence in the pupils, unless perchance they have unusual initiative and resourcefulness to start with. The key to successful teaching, assuming that both the material and the manner of organizing it have been determined, consists in knowing how to assist the learner in such a way that he thinks his way through his difficulties. As some one has well said, "The good teacher is the one who makes his services less necessary each succeeding day." It is perhaps unneccessary to add that the one and only means of stimulating the learner to solve his own problems is ability to ask questions properly. In fact, evidence of this ability tells more quickly than any other one thing whether or not a person is, or may be developed into, a good teacher.

How to Put It Over

Before attempting to enumerate what experience has taught us to date, I wish to say that it is too early in the game for definite rules and regulations to be formulated. Since the work is only in its initial stages presumptuous indeed would be the person who would attempt to speak authoritatively regarding it. Before this can be done the field must be cultivated much more thoroughly. However, there are a few points in the way of method and objectives that seem unquestionably worth while, points which our better judgment says to recommend to others.

It may be well also to remark that when giving these

points I have in mind the foreman's job as a whole even though I am referring specifically to the teaching phase of it. That is, I am thinking not of the special teacher-foreman found in a few plants but of the average foreman who must put things over to his men along with all of his other numerous duties. For, as has been pointed out earlier in this article, all foremen must and do go through the formality of teaching or trying to teach.

The first point is one that cannot be overemphasized for work of this character cannot be effectively done at long range. To adopt an appropriate movie term, it must be a "close up" job. He who attempts to get it done by means of a series of evening lectures or even conferences is sure to fail. Likewise will that one who relies upon printed matter, however well-prepared it may be. Of this we may rest assured, that when our objective has to do with the establishment of desirable, and the correction or elimination of bad, habits, we must work intensively. In other words, *we must train the foreman on his job and for his job.* We must work with him, plan with him, execute with him, etc.

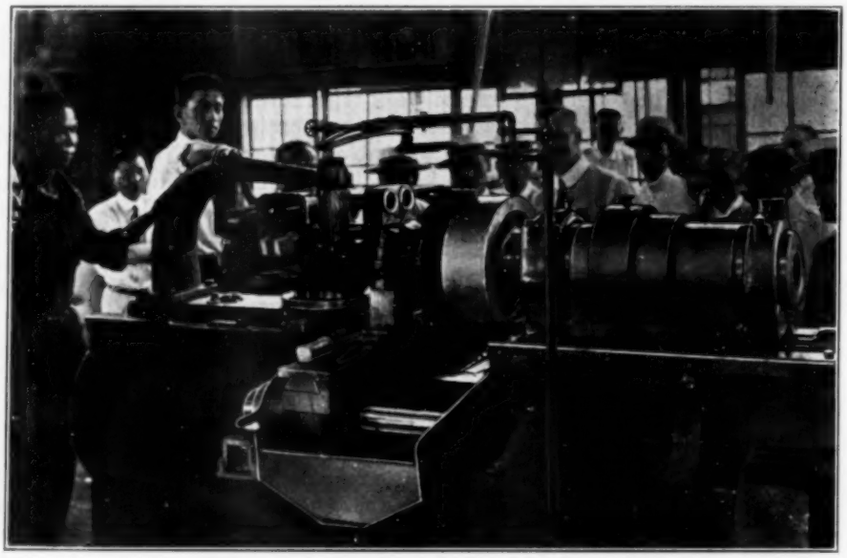
The second point is that whoever undertakes to do this type of work must never forget that he is establishing connections with a going concern rather than with one which is about to start and that, as a consequence, he must plan accordingly. It will not be safe, for example, for him to assume that all of the foremen are totally ignorant of good teaching methods even though they do not know them as such; and, on the other hand, it will be equally unsafe for him to assume that they have anything in the way of an organized background of information regarding how to teach. He should rather assume that his group is made up of men with various degrees of ability to teach, some having much, others little, but that for the most part they never think of their work as resembling teaching in any way. Another thing the leader will do well to keep in mind is that since the establishment is already running he must somehow find a way of fitting into it, of modifying himself, his material, and his method rather than trying, especially at first, to modify plant conditions. In short, he had better adopt the evolutionary rather than the revolutionary method of selling himself and his ideas.

The last point I shall mention is that if there is any one place where patience is indispensable to success this is the place. Let him who lacks it, therefore, leave this work alone. The foreman with fifty other important things to take care of during the forenoon is not likely to respond kindly to any elaborate program along teaching lines. The most that can be expected is to "get under his skin" at occasional intervals. If these vulnerable points are remembered and future attacks governed thereby, results in the way of changed methods will come slowly. But be it known, once and for all time, that patience and proper personality are indispensable to putting this type of job over successfully.

One Way of Selling Machinery in Japan

The accompanying illustration shows an automatic machine on demonstration in the plant of the Kyushu Electric Light and Railway Co., at Hakata, in the Island of Kyushu, south of Japan proper. The job being machined is a bracket for a 5-hp. motor. The photograph was sent by Arthur Jackson, representative of the Potter & Johnston Co. in Japan. He advises that the machine was shipped nearly a thousand miles for the demonstration in accordance with the belief of the Japanese in their saying "Hundred times hearing is inferior than one seeing." The shipment was made by the Yamatake Co., agents for Potter & Johnston, National Acme and Gridley automatic machines.

Our correspondent further advises that the demonstration caused great interest and was the means of securing good orders; that the leading manufacturers in Japan are now well aware of the advantages of using automatic machines, and that when the present depression is over there will be fairly large orders given out for both chuck and bar working machines.



DEMONSTRATING A P & J AUTOMATIC IN JAPAN

Planing Flat Gibs—Discussion

BY FRANCIS PAQUIN

In the article "Planing Flat Gibs," page 219 of AMERICAN MACHINIST, Tell Berna advises that the gib should be tapped lightly on a block of babbitt, to cause a slight curvature. When the gib is laid on the table the middle is in contact and the ends slightly raised. The ends are then pulled down by clamping. This procedure may be correct, but on releasing the ends may return to their former position. In that case the gib would be parallel but not straight. On finishing the gibs where the full contact of the table and gib is necessary, Mr. Berna does not give any method to obtain this contact. The gib is probably not straight and the chances of the middle not touching the table are increased.

I think that the bending would be made unnecessary by placing tissue paper at the ends and middle. After clamping, the papers are given an easy pull and if they hold, contact is assured.

Rolling the Teeth in Hot Gear Blanks

Process Eliminates Cutting Gear Teeth—Rolling Bevel Gears in Fifteen Seconds—Saving 20 to 40 Per Cent of Metal

By FREDERICK E. WALKER, Jr.

AS EARLY as 1872 John Comley attempted to mold gear teeth on a blank heated to forging temperature by a knurling process. His efforts were unsuccessful because of the neglect to take into consideration the inevitable slippage between the die roll and the heated blank, if the rotational motion of either was dependent on that of the other.

The one factor vitally necessary to the successful perfection of gear rolling was overlooked until H. N. Anderson, of the Anderson Rolled Gear Co. Cleveland, Ohio, some ten years ago conceived and developed the idea of positively actuating both of the functioning shafts and accurately synchronizing their rotation by driving them through independent timing gears. This improvement entirely eliminated slippage between the die roll and gear blank and the resulting tooth distortion and inaccurate spacing which had caused the failure of previous attempts to roll gears from a heated blank. Mr. Anderson's original idea in developing this method and constructing his first machine was to replace the gashing operation (used as a preliminary step in the prevalent method of gear production) with the rolling process and then to finish the gears in the usual manner.

The first machine, completed in 1911, not only established the soundness of his idea, but also produced gears with teeth so perfectly and precisely formed that any further finishing operations on the teeth were unnecessary. This achievement won for Mr. Anderson the award of the John Scott Legacy Medal by the Franklin Institute, in 1915.

The perfection of the process then resolved itself into a question of developing a system of gearing that would permit of the use of accurately formed die rolls which could be produced at comparatively low cost and could be redressed when necessary without destroying the precision of the molded tooth profile during the life of the dies. The accomplishment of this and of the next step—adaptation of this system of dies for use in a machine operating on the principle evolved—has completed the dream of the theorists as to the practical production of gears by a process of true molding.

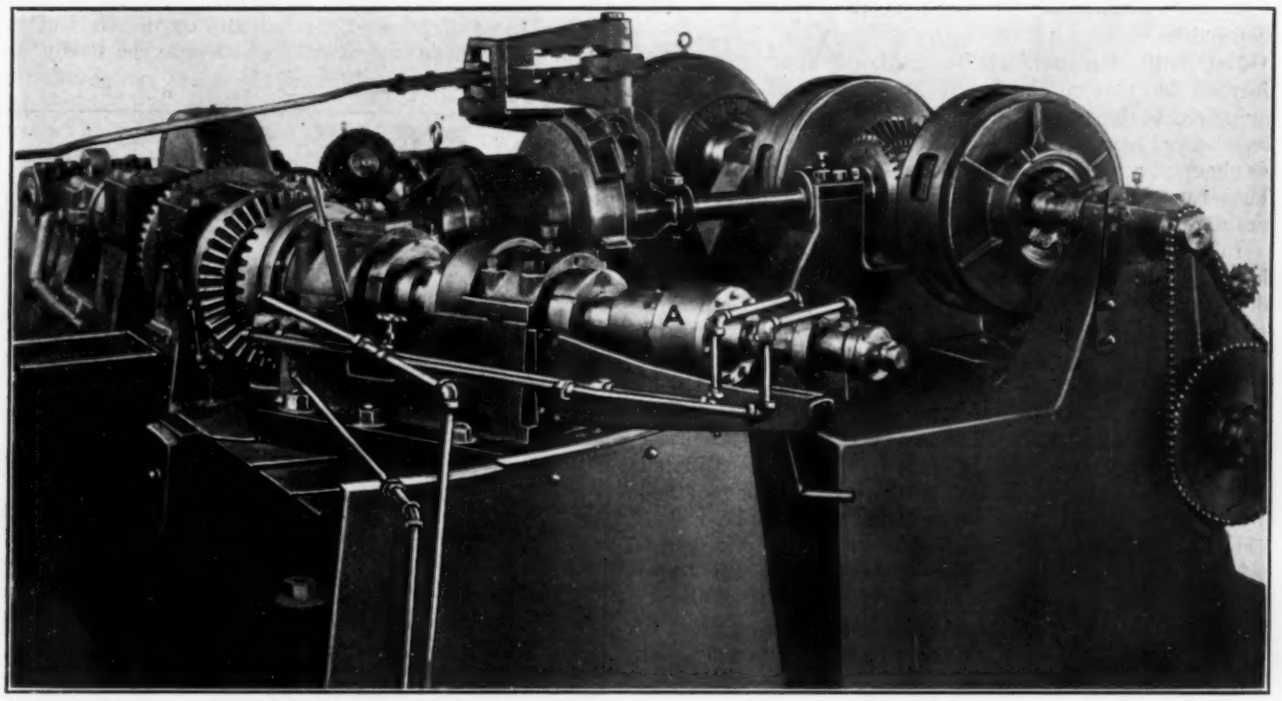


FIG. 1. ANDERSON GEAR TOOTH ROLLING MACHINE

The high cost of producing die rolls with a maximum degree of precision made it a primary necessity to devise a form or shape of tooth for the die rolls which would minimize this first cost and also make possible economical and accurate redressing. This proved to be no very difficult problem as the plane sided tooth of the standard involute rack and the characteristic tooth of the standard crown gear, provide in each case forms which can be easily and cheaply produced with a very high degree of precision and which can be reproduced or redressed with equal ease and accuracy.

For the production of standard, helical and herringbone gears of the spur type, a die of the involute form could not be used; first, because of the practical impossibility of cutting a die of this form with absolute precision at a reasonable cost, and second, because the curve profile of the standard spur tooth could not be accurately redressed when worn. The rack form of tooth in the involute system of gearing, however, avoided these drawbacks and was adopted as the standard for die rolls for the production of all spur type gears.

The master form of die tooth is applicable to the

formation of helical or spiral spur gears by making the tooth spaces of the die in the form of oblique straight cuts across its face, although the resulting tooth spaces are somewhat deeper at the center than at the ends. On the gears molded from die rolls of this form the teeth are, of course, somewhat shorter and heavier at the ends than in the center. The gearing so formed is actually stronger than gears of the same pitch with teeth of uniform dimensions, as the greater central tooth depth tends to increase the arc of contact at the center of the face.

Herringbone gears may be as accurately and cheaply produced as the other types by the simple expedient of a compound die roll, made up, to enable easy redressing, of two helical die rolls of opposite spiral angle, keyed and securely bound together when functioning, and readily taken apart for separate dressing of the two halves.

Not only can perfect herringbone spur gears be formed by this method, but application of the same principle to bevel gears by forming compound dies of two helical bevel gear dies, will produce, as rapidly and as cheaply, a perfect herringbone bevel gear as in Fig. 6. This form of gear has never before been possible of practical production.

In the actual process of rolling the gears, the blanks heated to a temperature of between 2,000 and 2,100 deg. F., are mounted on the work arbor of the machine shown in Fig. 1 and securely clamped in place by means of a powerful automatic chuck, mechanical, pneumatic or hydraulic as at *A*. The set-up is shown in Fig. 2, where *A* and *B* are the driving gears, *C* is the die and *D* the gear being rolled. The arbor carrying the blank and that carrying the die roll, having been adjusted to the proper angle in respect to each other as required by the type and dimensions of the gears to be rolled, the blank and die are then rolled in precisely synchronized contact under a rolling pressure of from 10 to 20 tons.

The die roll is automatically advanced to positive contact with the blank as the rolling commences. As the rolling continues at high speed the die roll is advanced until the teeth of the die have penetrated to nearly full depth in the plastic blank. The advance is then slowed somewhat until the formation of the gear is completed and die and gear are in full engagement. This movement of the die roll is automatically produced by means of a smooth positive cam mechanism which accomplishes a regular and constant progression in the first stage and a gradual retardation as the die approaches full depth. This cam mechanism is also designed to assure full penetration of the die teeth before the heated blank has cooled below its critical temperature and then continue the rolling with no die advancement until the blank has cooled somewhat below this point.

As the rolling is done as a rule at speeds varying from 400 to 700 r.p.m., depending on the size of machine and the size of the gear rolled, it is apparent that advance of the die per revolution is very slight. This assures a very thorough kneading and working down of the metal of the blank and permits the metal to flow evenly and freely. The fact that both die and blank are positively driven and accurately synchronized assures the die teeth penetrating the blank radially in exactly the same position on each revolution, and entirely eliminates any slippage or tooth distortion in the finished product.

During operation the die is cooled by a stream of water directed against its face at a point farthest from contact with the hot blank. Through the entire process, consuming only a few seconds, the temperature does not rise above a heat easily bearable to the hand. The chilling effect of the comparatively cold wet die on the heated blank causes a sudden contraction and consequent loosening of the scale formed, which is then thrown off by the centrifugal force resulting from the high speed of operation. Since the rolling is continued until the blank has cooled below the critical temperature, or in other words until after the formation of forging scale has ceased, the finished product of the process is entirely free from scale and the formed teeth are not only perfectly shaped but are also higly polished on all contact surfaces. This fact, of course, eliminates any necessity for further finishing operations, except on the bore and faces of the hub and on the ends of the teeth. For these operations, which may be easily and semi-automatically performed, the gears are chucked on

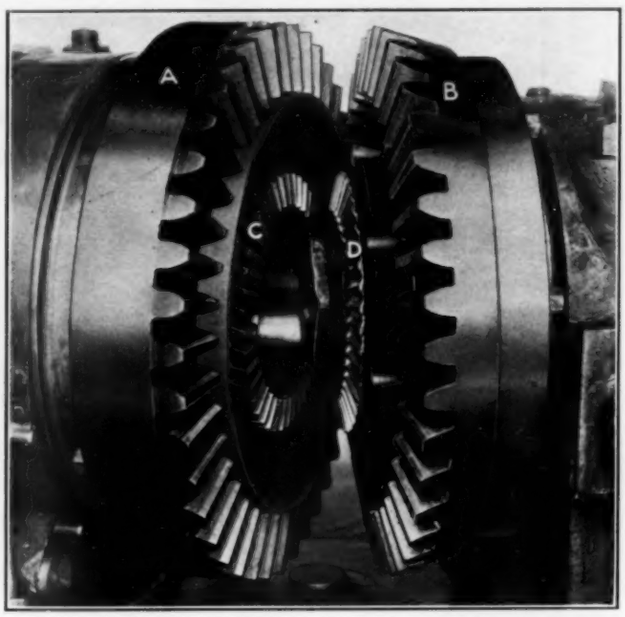


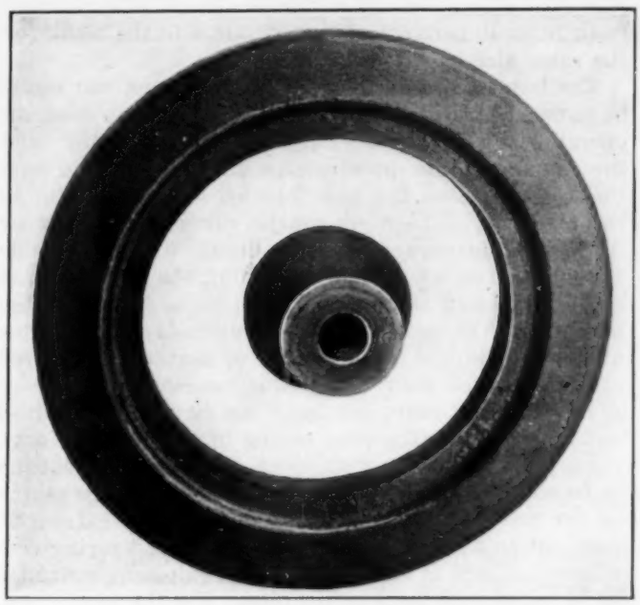
FIG. 2. THE TIMING GEARS, THE DIE AND THE WORK

the accurately rolled teeth, thus assuring perfectly accurate centering.

In order to assure the highest possible degree of precision of tooth form, machines designed for the production of extremely accurate and perfect gears are equipped with additional mechanism for frequently and automatically reversing the shafts carrying the die and blank. This frequent automatic reversing or oscillation, at somewhat reduced speed, (varying from about 80 to about 200 r.p.m.) during the forming of the teeth and nearly to the point of full engagement, assures displacement and building up of the metal to an equal degree on both sides of the teeth, producing an absolutely symmetrical tooth. The full cycle of operations of the oscillating type machine, automatically controlled, is as follows:

High-speed direct rolling, the die roll advancing to positive contact with the gear blank.
Oscillating rolling at reduced speed until the teeth of the die roll reach within about 0.010 in. of full depth.
Planishing by high-speed direct rolling until the die-roll teeth engage the gear to full depth.
High-speed withdrawal of the die roll.

The die rolls are somewhat narrower than the gear blanks and the effect of this is the production of gears which are partially or fully shrouded. Blanks are shown



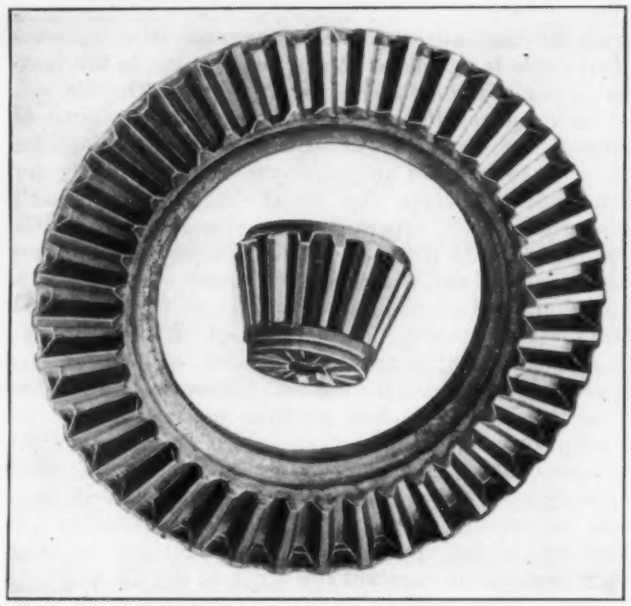


FIG. 3. GEAR AND PINION BLANKS. FIG. 4. AS THEY COME FROM THE MACHINE

in Fig. 3 and the rolled gears in Fig. 4. Consequently if it is desired to strengthen the weaker member of a pair of gears, the shroud may be left on, either entirely or partially, or the shrouds on the two gears may be so proportioned as to equalize the strength of the two and greatly increase that of the combination. The degree of this increase in strength cannot well be accurately determined, but considering the greater inherent strength of rolled teeth, it would probably be a conservative estimate to assume that rolled shrouded gears have at least double the strength of ordinary cut gears of the same pitch, permitting the use of rolled gears of half the pitch for the same purpose.

As the actual operation of molding the plastic gear blank ceases when the heated blank has cooled below its critical temperature, and before there is any appreciable increase in the temperature of the die roll, it is of course necessary to design and proportion the die rolls for molding gears at that temperature. Consequently the dies must all be somewhat oversize as compared with the finished gears at normal temperatures. Die rolls properly made and proportioned should as a rule permit of the production of at least 500 accurately formed gears before any redressing becomes necessary, and should also permit of a considerable number of redressings during their lives.

All types and sizes of die rolls having the master-form gear teeth can be very easily redressed whenever wear or dulling makes it necesary. It might at first appear that this refinishing, especially in the case of

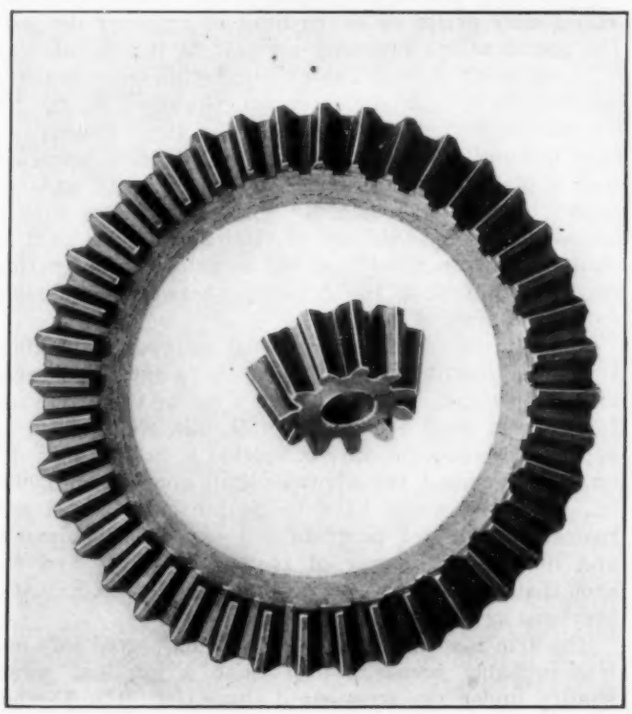


FIG. 5. AFTER BEING TURNED, FACED AND BORED. FIG. 6. HERRINGBONE BEVEL GEAR AND PINION

gears of the spur type, would immediately introduce appreciable inaccuracies in the product due to the inevitable slight reduction in the diameter of the die roll, which must result from each refinishing. It must be remembered, however, that both the gear blank and the die roll are mounted on shafts which are positively and independently driven and whose rotations are exactly synchronized by separate timing gears. Thus the angular distance between the teeth molded on the blank is controlled and maintained constant, regardless of any slight reduction in the diameter of the die, or the size of the die teeth. The only effect of this reduction in diameter, if it is appreciable at all, would be a very slight creep between the die and blank when in motion. This creep would be held uniform and constant by the timing gears and, as the thickness of the molded teeth is dependent on, and controlled by the width of the tooth spaces of the die, even a considerable amount of creep may be readily counteracted by simply reducing the thickness of the die roll teeth that slight degree necessary to maintain constant the width of the die roll tooth spaces. This modification of die roll proportions, however, is entirely unnecessary in the case of the crown or flat bevel type of dies used in the molding of any type of bevel gears. With these forms the grinding of the teeth does not affect the diameter of the die rolls.

The greater inherent strength of rolled gears is due to the effect on the structure of the metal by rolling under high pressure. This pressure and the thorough kneading action of the die teeth on the metal while in the plastic state, in addition to building up and compressing the metal into the formed teeth, gradually breaks up the coarser crystalline structure and produces a dense, thoroughly worked and more fibrous structure. The minute crystals are rearranged in a trussed formation, thus tying the teeth to the body and equalizing structural strains. The elimination of internal structural strains is so marked that no distortion whatever occurs in subsequent heat-treatment, and it has even been found entirely unnecessary to use any clamps to hold the gear true in quenching. Exacting laboratory tests amply confirmed by service tests under the most severe operating conditions, have shown a superiority for rolled gears over the best of cut gears, averaging 25 per cent in strength and 20 per cent in hardness, as shown in the accompanying table.

CHARACTERISTICS OF MACHINE-CUT AND HOT-ROLLED GEARS

	Machine-Cut Gears	Hot-Rolled Gears
Normal condition:		
Yield point	6,470 lb.	7,918 lb.
Ultimate Strength	12,250 lb.	13,645 lb.
Hardness	22	26
Case Hardened:		
Yield point	13,529 lb.	14,750 lb.
Ultimate strength	17,250 lb.	19,130 lb.
Hardness	37	85
Penetration of case	0.027 in.	0.035 in.

The hot-rolling process makes possible quantity production of gears at a far lower unit cost than by the cutting method and the inherent characteristics of the process permit of considerable savings in material and labor costs, and in overhead and equipment investment as well.

As the teeth are formed on the finished gears by displacement and building up the metal, rather than by cutting it away, the gear blanks are so proportioned as to require cutting away of waste metal only in finishing the hubs and removing the shrouds. It is thus possible to make a saving in the actual weight of metal required in a gear blank by an amount ranging from 20 to 40 per cent of that required in the blank for the same size of cut gear.

The largest size machine so far developed can easily be handled at a high production speed by two men, an operator and a helper. The operator can easily tend the running of the machine, leaving the helper to tend the furnace, heat the gear blanks, and feed them to the machine. Either job can be efficiently handled by intelligent laborers under the direction of a capable foreman. The actual time of rolling the largest gears so far produced is under 15 seconds, so that it is apparent that the saving of labor time-costs is very large, and is only limited by the degree of dexterity and speed attained by the crew. A production rate of eighty or ninety finished gears per hour can be readily attained and maintained. The time saving in actual tooth forming over the fastest method of accurate gear cutting is from 90 to 95 per cent or even higher, the time saving in the production of completed gears ranging from 25 per cent to as high as 80 per cent under varying conditions. There is also a saving in equipment estimated at 50 per cent or more of the total. For the tooth forming alone the saving is estimated at 70 per cent.

Big Shops Versus Little Shops

BY HARRY SENIOR

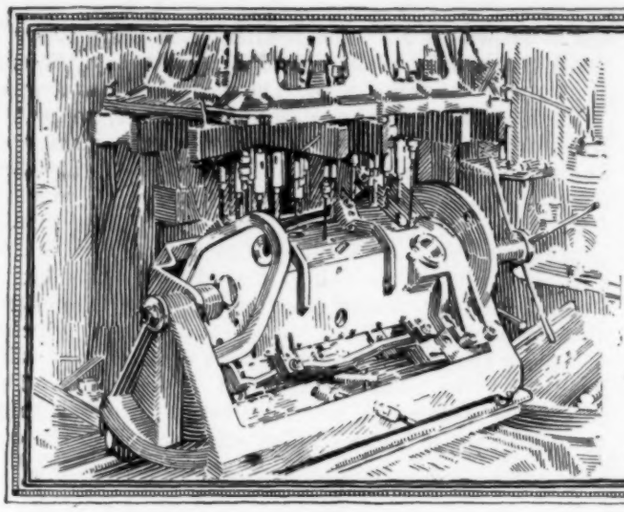
An article on page 99 of AMERICAN MACHINIST, entitled "Big Shops versus Little Shops" and written by the late W. D. Forbes, attracted my attention for several reasons.

The first reason is this: Either your type has betrayed you or else Mr. Forbes was a joker and was trying to catch somebody napping. If holes of any size are to be drilled in a circle of 1½-in. pitch diameter through a disk of metal the outside diameter of which is also 1½ in. (these dimensions are from the printed specifications) then one-half the diameter of each hole will be "in air" and the job not so simple as it at first seems.

Dismissing this as a typographical error, the question immediately arises as to the limit of accuracy desired. The specifications promptly suggest to the mechanical mind an index plate. The extremely liberal tolerances specified on outside diameter and thickness do not in any way controvert this conception, as these dimensions have nothing whatever to do with the functioning of such a plate; but the matter of concentricity and accuracy of spacing, which Mr. Forbes dismisses with a casual "evenly spaced," are of vital importance, as it is easily to be conceived that the slightest error in this respect might make the difference between a valuable tool and a piece of junk.

It is not my intention to discuss methods of making. It is not a question of big or little shops but of looseness of specifications. If the job turned out by the little shop for $5 was good enough, then it was well paid; my apprentice boy could have completed it in an hour. If, on the other hand, the allowable limit approached 0.0001 in., the work would have to be buttoned, bored and reamed, calling for accurate and expensive equipment and the highest degree of toolmaking skill; and the shop that could get away with it for $40 is exceptional—overhead or no overhead.

The firm that made the $40 quotation played safe and was probably prepared to furnish a job that would qualify under the most rigid inspection; the $5 shop "took a chance." If Mr. Forbes wanted a $5 job he should have said so.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Tapered Reamers for Roughing and Finishing—Principles of Floating Reamer Holders for Turret Lathes—Pin-Type and Full-Floating Holders

BEFORE reaming a tapered hole, it is necessary to provide a true-running hole. To accomplish the latter, it is advisable first to bore straight several steps of the taper. On very shallow tapers it is obvious that the hole should be bored straight, entirely through the work; but on tapers having considerable angle and on large sizes, the method first suggested will be found of advantage. There is considerable trouble caused by "chatter" when using taper reamers, and it is advisable to look into the reason for this so as to counteract it in the design.

A Common Form of Chatter

The most common form of chatter when reaming a tapered hole is that caused by the reamer tending to pull into the hole. If the tool works to one side, it has different amounts of material to remove on opposite sides, so that it cuts unequally. The consequence is that it either breaks or starts to chatter. If it is possible to pilot a tapered reamer, this is a great advantage; but it cannot always be done. If considerable stock is to be removed from the hole, as in the case of a rather abrupt taper, it is well to use several tools in the hole. The first tool should be a boring tool having several cutters, which will generate two or three steps of the taper. The second tool can be a taper roughing reamer of the form shown at *A* in Fig. 334.

The design of tools for roughing out taper holes is controlled to a great extent by the angularity of the taper, and the condition of the hole before it is reamed. Assuming that a given piece of work has been previously bored, as mentioned, and that all scale has been removed from the inside, the tool *A* can be made up with three or more lips, the number depending upon the size of the hole.

For comparatively small sizes three lips are sufficient, and there is a distinct gain in the cutting action, because the stock is removed much more easily and with less pressure. For large diameters more lips can be used, but a general principle is to use as few flutes in a roughing tapered reamer as possible. Many times lubricant is necessary, and deep wide flutes allow it to enter readily and permit the chips to be washed out freely. For abrupt tapers the roughing reamer can be made with a right-hand helix, but for shallow tapers it should be straight or with a slight left-hand helix, in order to prevent "drawing in." For roughing out the hole the taper reamer should first be formed, and after this it should be broken up into a series of steps *B*. A groove having a lead of from ¼ to ½ in. should be cut at the end of each step, as shown at *C*. The steps and groove can be considered helical in form if the taper be disregarded, although they resemble a spiral when the taper is viewed from the small end. This groove allows cutting teeth to be formed, as indicated at *D*. Each of the steps should be back tapered slightly in order to permit free cutting. This is illustrated clearly in the enlarged detail at *E*. If the groove *D* is cut on a right-hand helix, it will automatically relieve the ends of the teeth, so that they will cut freely. The teeth should be relieved eccentrically on a relieving attachment and then hardened, after which the flutes may be ground to give a cutting edge.

The finishing taper reamer shown at *G* usually has more flutes than the roughing reamer. The flutes may be straight or with a left-hand helix angle, but never with a right-hand angle, as this would cause the reamer to draw in and chatter. In reaming steel, a narrow helical groove can be cut with a lead of ¼ in. or so, the entire length of the reamer. When this is done, one tooth overlaps the other and no grooves are apparent in the finished work. At the same time, the chips are removed much more easily, because the cutting action is considerably relieved. On very long surfaces, this groove will be found to assist materially in making the cutting action easier.

Floating Reamer Holders

When holes are reamed by hand, the reamer naturally follows the generated hole; but when held rigidly in a machine, improper alignment may cause the reamer to cut oversize or otherwise incorrect holes. Some of the causes of failure of reamers to cut true to size can be attributed to the method of holding the reamers, while others may be due to an incorrectly generated hole or one which does not allow sufficient stock for the reamer to remove. A great deal depends upon the way in which the work is held, and the preliminary work which has been done in the hole before reaming.

We shall consider the application of floating holders

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to turret-lathe work, and the reasons which make it necessary to use holders of the floating variety. Fig. 335 shows a piece of work *A* which is to be sized by the reamer *B*. The latter is held rigidly in a holder *C* fastened to the face of the turret. We shall assume that the hole in the work *A* has been generated, so that

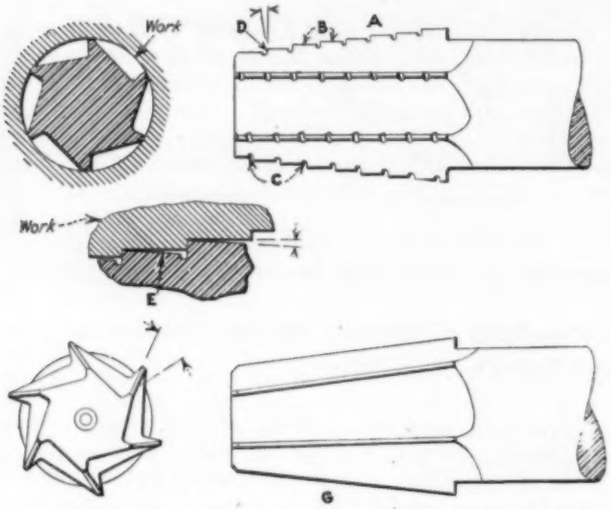


FIG. 334. ROUGHING AND FINISHING TAPER REAMERS

it is true with the center of rotation of the work. If then, every part of the machine is in perfect alignment, and if the reamer is located directly on the center line of rotation, the hole should be of correct size after reaming.

In actual practice it seldom happens that all parts of a machine are in perfect alignment, and therefore the reamer would be more apt to cut unequally if held rigidly in the holder as shown. If the turret has been used considerably the center line of the holder is likely to be several thousandths of an inch below the center of the work, which would naturally cause the reamer to take a position, as shown, considerably below the center line. The result would be an over-size hole if the reamer were to be held rigidly. This condition is frequently found in turret lathe work.

Less common is the condition shown at *D*, in which the center line of the holder and work do not correspond, due to an inaccurate setting of the holder *E* on the face of the turret, so that the reamer *F* is off center on one side an amount indicated between the arrows at *G*. The hole would also be over-size if reamed in a rigid holder under these conditions. The example at *H* shows a turret which does not index correctly on account of considerable abuse or overhauling by unskilled labor. In this case, the reamer would take the position shown at *K*, and the result here would also be an oversized hole. The angularity between the center line of the work and the center of the reamer is shown at *L*.

Of the three conditions, the most common is that shown at *A*, in which the turret slide has been worn by use so that the center line of the turret is slightly lower than the center of the work. In order to counteract all the conditions just mentioned, it is necessary to hold a reamer in some type of "floating holder," so that it can automatically align itself with the center line of rotation and follow the generated hole correctly. In theory, a holder must be devised for this purpose which will permit the reamer to float in all directions.

An example of a holder intended to provide this floating is shown at *M*. The reamer *N* is mounted on a shank *O* which is enlarged at *P* and slotted on the end, as shown in the detail at *Q*. The member *R* has tongues on both sides at right-angles to each other, so that it freely fits the slot *Q* and another slot in the member *S*. The latter member is pivoted at *T* so that it will swing freely. The shank *U* is held in a holder at *V*, which is fastened to the turret. Excess movement of the reamer is prevented by a small amount of clearance in the restraining collar *W*, which is pinned to the member *S*. The reamer is prevented from pulling out by an adjustable threaded sleeve *X*. A holder based on this principle will allow the reamer to float in any direction and align itself with the center of rotation of the work. This particular example is not intended to show anything more than the principles which are involved in the con-

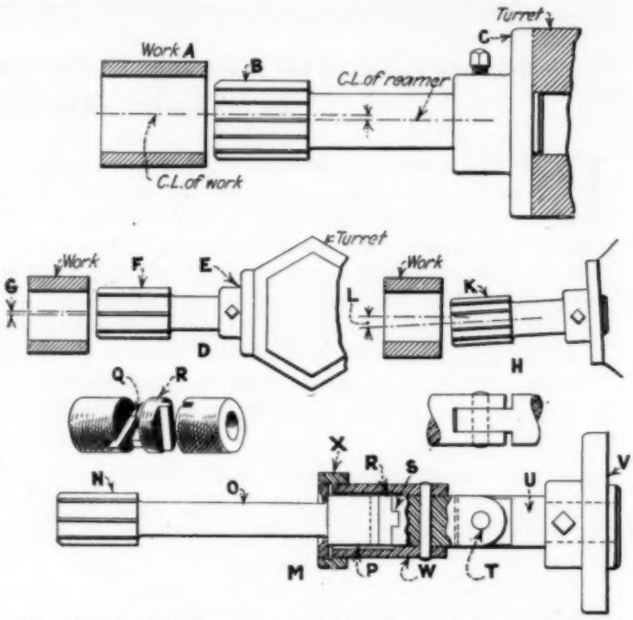


FIG. 335. PRINCIPLES OF FLOATING REAMER HOLDERS

struction of a true floating reamer holder. It can be modified and developed to suit a particular case if desired.

PIN-TYPE HOLDERS

Many writers have discussed methods of obtaining a true floating reamer holder. While we do not wish to differ from many of the statements made on the subject, we shall simply state that there are many cases when a very simple type of holder which is theoretically incorrect, will produce a commercially true hole of a diameter determined by the size of the reamer. This is largely due to the fact that the error in alignment between the turret and the work is usually in an up and down direction, so that a float in this direction will take care of the majority of cases. Fig. 336 shows in simple form several types of floating reamer holders. Many of them are more or less objectionable from the standpoint of theory, but at the same time they are often used successfully.

In the example at *A*, the shank of the reamer *B* has a pin *C* driven through it. The holder *D* is located in the turret by some convenient method. A hole *E* in the holder is made slightly larger than the pin, and the shank *F* is somewhat smaller than the hole *F* in the holder. By this means the shank is permitted to float up and down freely, and a certain amount of side motion

is also permissible. Furthermore, the shank rocks on the pin so as to take care of slight angular errors. This holder is not theoretically correct, as will be shown later, and yet it is a type very commonly used in many shops and producing more or less satisfactory results.

The example shown at *G* consists of a holder *H* of

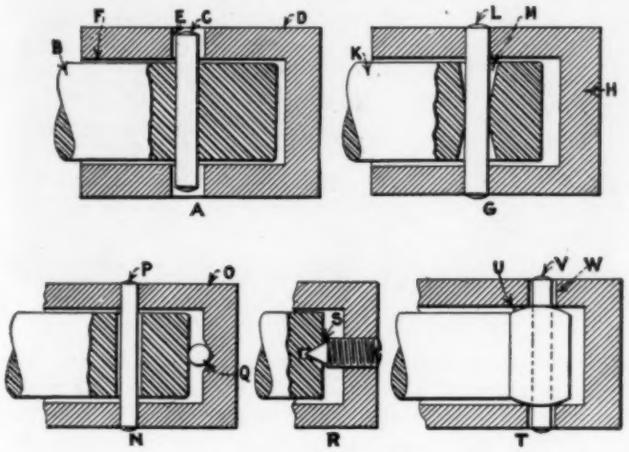


FIG. 336. SIMPLE TYPES OF FLOATING REAMER HOLDERS

suitable size to fit the turret of the machine. The shank of the reamer shown at *K* is slightly smaller than the hole in the holder. The pin *L* is a driving fit in the holder itself. A hole through the reamer shank is countersunk on both sides and tapered, as shown at *M*. The center of the hole fits the pin snugly. The theory of this type of holder is that a slight spring or rocking action will take place when the reamer enters the generated hole in the work. The reamer may move up and down slightly on the pin. Although not strictly correct in theory, this holder is simple and very fair results can be obtained by its use.

Another example is shown at *N*, in which the holder *O* has a pin *P* driven through it. The reamer shank is drilled slightly larger than the diameter of the pin, and the thrust on the reamer is taken by the ball *Q* which rests in a countersunk hole in the holder. This method of holding permits the reamer to float up and down, while a certain amount of angular movement is also allowed. In the example *R* a center *S* is used in the end of the reamer shank. This method is objectionable, as it centers the reamer and does not allow it to parallel itself to the generated hole in the work.

A very old type of floating reamer holder is shown at *T*. Many factories use something of this kind as a floating reamer holder, but it is open to numerous objections. The shank of the reamer is turned in spherical form at *U* to a diameter slightly smaller than the inside of the holder. The pin *V* is used as a driver, and is allowed to float in the oversize hole *W*. If sufficient clearance is provided between the spherical end *U* and the inside hole, this type of holder can be made to produce very good results. If the turret is considerably out of alignment, however, and there is only a small amount of clearance in the hole, the reamed hole is likely to be "bell-mouthed."

The diagram shown in Fig. 337 illustrates the reasons why a reamer using a pin driver does not always work out as satisfactorily as it should. In the first example a sectional view of the holder is shown at *B*. The reamer shank *C* has a pin driven through it at *D*, and clearance is provided for this pin in the hole *E*. If the center of the reamer holder is slightly below the center of the work, as shown at *F*, the shank of the reamer will float until it takes a position like that shown at *G*, and the pin will drive against both sides of the hole. The reamer, however, will find the center of the generated hole without difficulty, as is shown by the fact that the center line of the pin *H* crosses that of the holder.

If we assume another condition in which the turret hole is off center an amount shown at *K*, the driving pin *L* must take a position like that shown in order to have the reamer parallel itself to the hole. This is all very nice as far as it goes, but the moment that the pressure of the cut is applied under a condition of this sort, the pin immediately is thrust over and acts as a driver

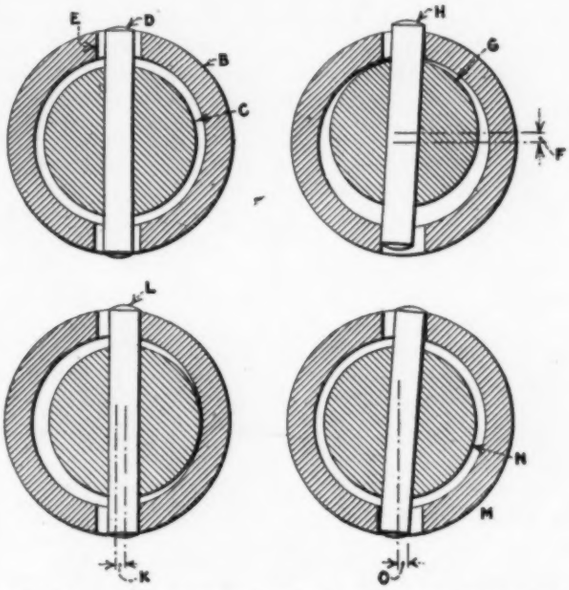


FIG. 337. ACTION OF PIN-TYPE FLOATING HOLDERS

against the two sides of the hole, as shown at *M*. This action causes the shank of the reamer *N* to assume a central position in the holder, which position differs from the center line of the work by an amount indicated between the two arrows at *O*. From these examples, it can be readily understood that a very simple type of floating holder will take care of variations in the vertical position of the holder and work, but will not give good results when there are other inaccuracies in alignment.

Full-Floating Holders

In Fig. 338 is shown at *A* a type of holder designed to overcome the ordinary difficulties found in floating reamer holders. The body *B* contains a floating member *C*, which is tapered to receive a taper-shank reamer. A ball thrust bearing is provided at *D*, and all the thrust is taken at this point. The driving action is by means of a pin *E*, which floats freely in the shank as shown. It is restrained by the setscrew *F* so that it does not have too great a movement, and at the same time it is perfectly free to take a central position with respect to the work. In action, the tendency is for the reamer to parallel itself to the hole, the action being assisted by the wide thrust bearing mentioned.

Another type of floating reamer holder designed to correct misalignment is shown at *G*. The shank *H*

is held in the turret and the reamer shank *K* is permitted to float in several directions. The shank *H* is threaded to receive the nut *L*, which is screwed up against the shoulder as shown. On the outside of this nut a retaining collar *M* is screwed. The front end of this collar is threaded internally to receive an adjusting nut *N*, which controls the amount of float permissible in the reamer. The shank of the reamer is fitted with a nut *O* that is intended to prevent the reamer from pulling out of the holder. Hardened pins are inserted at *P* and *Q*, and against these pins the thrust of the reamer is taken through the ball *R* which is interposed between them. The driving is accomplished by means of a floating member *S*, which is cut out as shown in the end sectional view. Each of the collars *L* and *O* has two lugs on it, as shown at *T* and *U*. There are four balls *V* interposed between the driving members. When in operation the reamer enters the hole and parallels itself to it by means of the floating action, which at the same time permits a driving movement that is not influenced by the location of the center

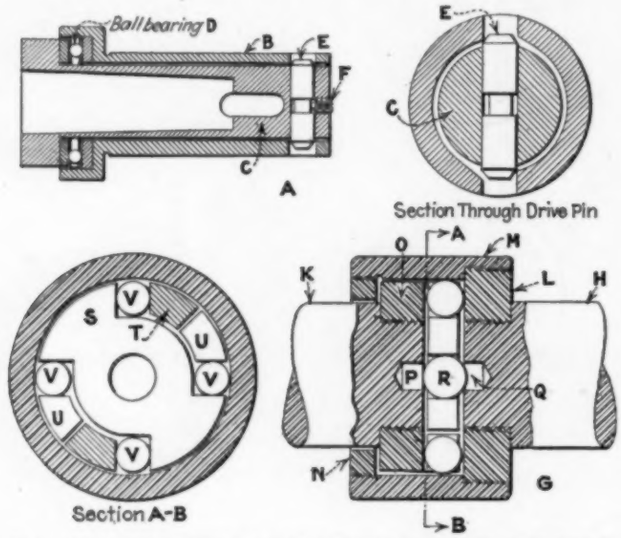


FIG. 338. TWO TYPES OF FLOATING REAMER HOLDERS

of the holder. A floating action is thus obtained which takes care of errors in alignment, both vertical and horizontal.

Applying the Broach to External Surfaces

BY MILTON WRIGHT

The part shown in Fig. 1. is a section of the feed roll of a spinning frame used in textile mills. The rolls are not more than 1¼ in. in diameter at the largest part, which is the notched or serrated portion, and many be anything up to 20 ft. in length according to the width of the machine on which they are to be used.

It is necessary that the serrated surfaces be hard in order to resist wear, and the finished roll must run true. As it would be practically impossible to make and harden a rod of this length and section to meet the requirements, it is standard practice to make them in lengths of 24 in., as shown, and join them together after finishing; the squared end to the right entering a correspondingly shaped socket in the end of the next rod so that when a full length roll is joined up it presents the appearance of a single rod.

The serrations are much like pinion teeth, but are

FIG. 1. THE FINISHED PRODUCT

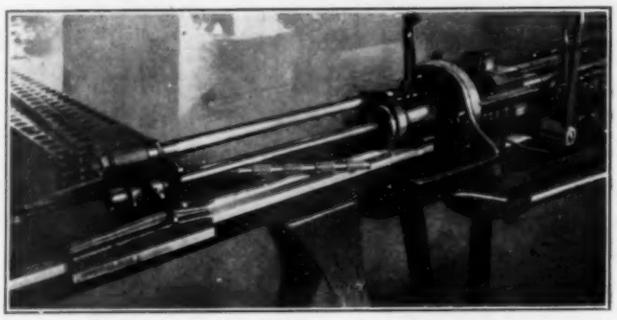


FIG. 2. THE BROACHING MACHNE

not teeth in fact, as the roll runs against a larger roll, the surface of which is covered with leather. To avoid wearing corresponding depressions or serrations in the leather, the teeth are irregularly spaced so that as the larger roll revolves against them the teeth do not come successively in contact with the same place each time and the leather surface consequently remains smooth.

The usual method of notching the sections is by planing them, and in any shop which manufactures textile machinery may be seen gangs of specially designed planers handling four, six, or even more sections at a time, indexing the pieces around one notch upon an index plate at each stroke, and feeding the cutting tool down a little at each complete revolution of the work, so that the depth of all the teeth increases practically in unison until the work is finished.

A method has, however, recently been put in operation by which these sections are produced complete at one pass, so far as the serrations are concerned, and at a speed of production approximately five times that of the planers. The tool cost of the new method is higher, but that is offset by reason of the reduced investment, for a standard broaching machine does the work of five special planers and occupies but little more floor space than one.

In Fig. 2 may be seen the broaching machine with one bar in place ready to go through the broaches, and a finished bar lying on the shears. The work is supported at the outer end by the crosshead, and is both pushed and pulled through the broaches. Seven broaches, shown in Fig. 3, constitute a set, and are held to the faceplate of the broaching machine by a special holder which locates them by the notches in the periphery. The locating notches are a very important feature;

FIG. 3. THE BROACHES THAT DO THE WORK

the more so because of the irregular tooth spacing which allows but one right position for each broach.

The face of each broach is beveled to an angle of about 10 deg. to give the requisite shear to the cutting edges. The broach holder is open at the top and a flood of oil is delivered upon the broaches during the cutting stroke.

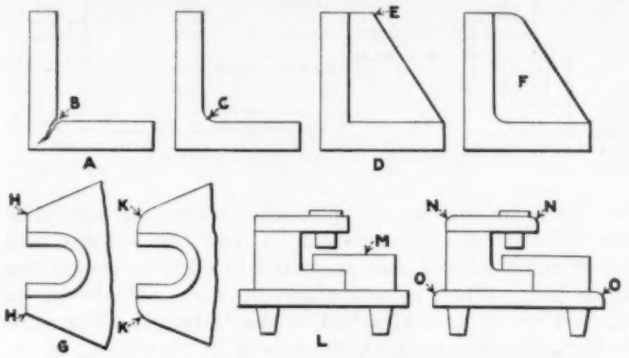
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Rounded Corners

BY ALEX DOWEL

In pattern work, especially for jigs and fixtures, we frequently hear the argument advanced that "it costs too much money to make the pattern with rounded corners." It is a question whether this policy is a good one or not, as there are several things to be considered. In making up an angle plate, such as that shown at *A* in the illustration, if the corner *B* is left square there is a possibility of a fracture at this point when the casting is made. On the other hand if made as shown at *C* the patternmaker is obliged to put in either a leather or wax fillet. A wax fillet is considerably cheaper than one made of leather, but it is not as serviceable. However, the wax is plenty good enough for jig work where only one or two castings are required. There is some extra labor involved in putting in a leather fillet, and on a complicated jig or fixture the extra time might increase the cost several dollars. The resulting fixture however would be very much better and stronger.



SHARP AND ROUNDED CORNERS ON PATTERNS

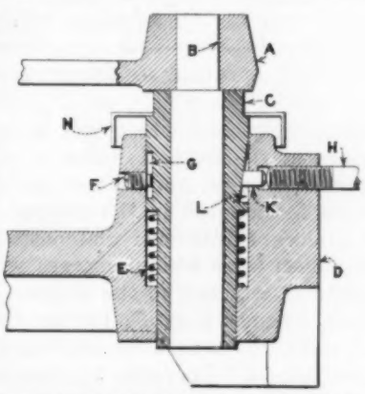
In the angle plate shown at *D* the rib *E* is used to stiffen the plate. The cheap way of making this would be as shown, but it certainly would not cost much money to round the corner as shown at *F* and the plate would then be much easier to handle. Rounded corners on the outside of a pattern cost very little and are usually a considerable improvement over sharp corners. An example which illustrates this point is shown at *G* in which the U-lug corners at *H* are left sharp. Is is much better to make them as at *K* even though the actual requirements of the work do not necessitate it. We might say that it looks better any way and the extra cost is nominal. Consider the man in the toolcrib who is obliged to handle the fixture and put it away and remember that a sharp corner is apt to injure his hands. Of course when the fixture is placed on the machine it does not make any difference whether the corners are rounded or sharp. It is interesting to note the difference in handling a fixture with sharp corners and one where they are rounded so that they do not injure the hands. A workman will place a well smoothed, rounded fixture in position on the machine very rapidly as he is not afraid of cutting or injuring his hands. If he picks up a jig with sharp corners and handles it he is inclined to be cautious, which causes delay and therefore it takes him longer to do the work than would otherwise be the case.

A built-up type of jig is shown at *L*. This jig is made entirely of steel and the corners are not rounded at all. It is therefore an unpleasant jig to handle and an actual test will show that the workman is much slower in loading and unloading the pieces *M* than he would be if the corners of the jig were rounded as shown at *N* and *O*. I have seen jigs which were turned out from the toolroom with corners so sharp that the workman could easily cut his hands on them and there is certainly no good reason for any such condition as this in a modern shop, where the operator must be considered as well as the work which he is doing. The conclusion a reasonable man should draw from the foregoing is that *it pays to round corners*, at least sufficiently so that the workman can handle jigs and fixtures without injury to his hands.

Spring Jack for Supporting Work

BY C. W. FRANK

Spring jacks are generally made with solid plungers or plugs, but if it is desired to locate a piece of work, for a drilling operation, directly over the plunger, it is necessary that the plunger be hollow. A draftsman drawing a tool requiring a spring jack very often offsets the jack when this condition occurs or probably uses some other means of supporting the work and condemns the use of a jack when it should be employed. The accompanying illustration shows a jack with a clearance hole through the plunger, permitting it to be located directly under the part of the work to be drilled. In addition, the jack has a few features which differ from common practice.



SPRING JACK FOR SUPPORTING WORK

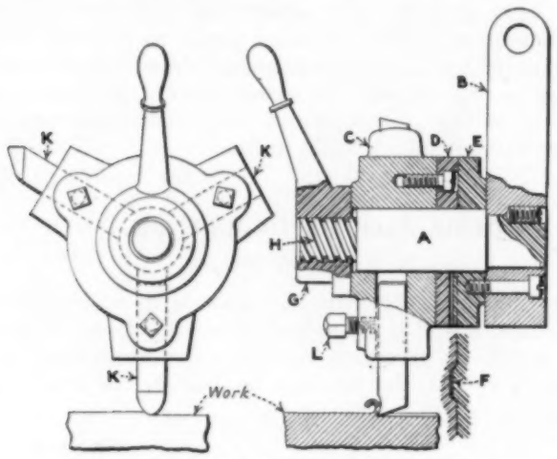
The portion of the work *A* to be drilled at *B* is shown in position. The plunger *C* fits into the body of the jig *D* and has bearing surfaces at both the upper and lower portions of the jig which add to the rigidity and wearing qualities, due to the length of the bearing in relation to its diameter. A spring *E* is provided to keep the plunger in an upward position and a setscrew *F* keeps it from turning and also limits its perpendicular

movement by fitting into the slot *G*. The locking of the plunger is done in the regular manner by means of a screw *H* which has a knurled knob on the outer end (not shown in the illustration). This screw forces a soft metal pin *K* against the angular surface *F* which prevents the plunger from moving downward under pressure when drilling. There is no danger of any chips interfering with the mechanism through the hole of the plunger, although chips would be apt to lodge around the outside and get into the bearing, therefore an inverted sheet metal cup *N* is provided over the upper end of the plunger to cover the opening.

Turret Toolblock for a Shaper

By Gene Phelps

In machining small quantities of work it is often necessary to use more than one tool, and the changing and setting of these tools require care in order to avoid spoiling the work. The toolblock shown in the illustration will be found advantageous for work of this kind, as it accommodates three tools which can be set up to size and then turned around in the various positions for the cuts required. The attachment can be easily fastened to a shaper head and affords a saving in



TURRET TOOLBLOCK FOR A SHAPER

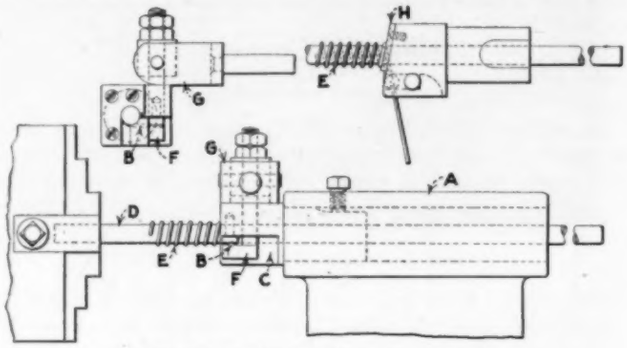
machining time which will soon pay for its cost. In place of the toolpost which is supplied on shapers, the post *A* is used and is held on the clapper *B* which in turn is mounted in the clapper box. The body of the toolblock *C* fits over the post and has a lockplate *D* fastened to it which engages with the stationary lockplate *E* attached to the clapper *B*. These plates interlock as shown at *F*, having three tongues and slots. A locknut *G* is used for binding the block in the required position and operates by turning it on the quick-lead thread *H* which is machined at the end of the post. The required tools are placed in position as shown at *K*, and are held securely by setscrews as at *L*. In operation, the work is suitably located on the shaper and the first cut is taken. Then the locknut *G* is released allowing the toolblock to be revolved into the next position, at which time the locknut is tightened up, thus locating the toolblock rigidly. Care should be taken in setting the central post that the lever of the locknut will be in a vertical position when the block is locked so that it will not interfere with the work. While the tool shown is provided to accommodate three tools it is possible to make a tool-block that will carry four tools if necessary.

Self-Feeding Spring Winding Attachment For a Speed Lathe

By Arthur Amende

The attachment shown in the illustration was made to produce a large quantity of coil springs of 0.032-in. wire, $\frac{3}{8}$ in. inside diameter and 2 in. long.

The springs were wound the full length of the lathe



SPRING WINDING ATTACHMENT

and then cut to size on a bench fixture. In applying the attachment, the tailstock *A* had the spindle and screw removed and was arranged to slide freely on the lathe bed. When in use a coil of wire, not shown, is carried on an arm attached to the tailstock. The wire is first threaded through the hole *B* in bushing *C*, given a half turn around arbor *D* and bent over into hole *E*. After bringing up the adjustable tension clamp *F* by means of cam *G*, the lathe is started. As this wire is being wound on the arbor it exerts pressure on the face of plate *H*, thereby carrying the tailstock along with it. When finished the spring is stripped from the arbor by releasing the chuck and pulling the arbor through the tailstock.

Any pitch of spring can be made with this device by changing the thickness and inclination of the gage plate *H*.

Removing Fire Clay from Tapped Holes

By Walter C. Schmidt

Many toolmakers, when hardening dies or similar tools, plug all the holes therein with fire clay to forestall the tendency to crack or break out through the hole.

TOOL TO CLEAN THE CLAY OUT OF THREADED HOLES

To clean the clay out of the threads after the die has been hardened is no easy matter, and I have seen many taps ruined by being used for this purpose.

A safer tool, and one that will accomplish the desired result as well and as quickly, can be made by filing or milling the end of a capscrew to an angle as shown in the sketch. It takes but a few minutes to prepare a screw for this purpose and, as the scraping edge can be renewed by a stroke or two of a file, one screw will serve for a long time.

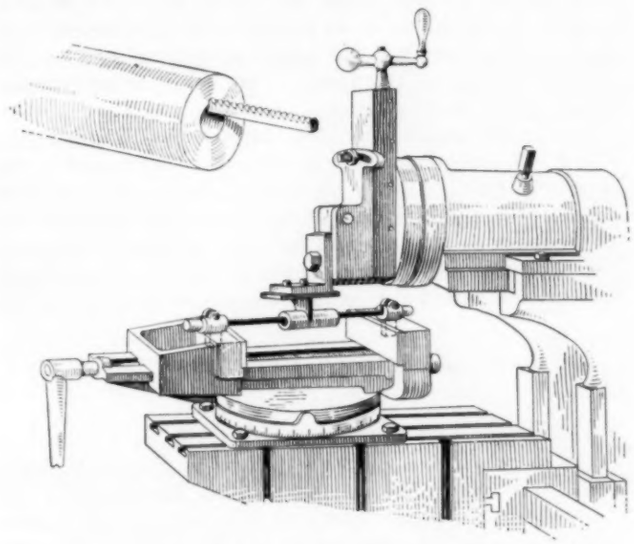
A Difficult Job of Splining

BY R. GRANT

A difficult job that fell to our lot some time ago was the cutting of small slots, resembling keyways, in the hubs of some aluminum brackets, as illustrated in the sketch. The hubs were 3½ in. long and the diameter of the bore was ¼ in. The slots, which will be referred to as keyways, though they were not such in fact, were to be 1/64 in. wide by 1/16 in. deep. After studying these relative dimensions the reader will, I think, agree that it was "some" job.

Following a discussion as to ways and means, the decision was reached that broaching was the only practical way to do the work, and we set about preparing a set of broaches by sawing a slot in the side of some pieces of ¼-in. drill rod, sweating in blades of tool steel, and grinding teeth in the blades after they had been sweated in place. We started with four teeth to each broach, spaced about 1 in. apart.

The scheme did not work out well. Notwithstanding the few teeth in contact and the comparatively wide spaces for chip clearance the chips would pile up in



CUTTING A VERY SMALL KEYWAY

a lump under each tooth, and we soon found that at least double the number of broaches we had provided would be necessary. Even with these the job promised to be a long and tedious one with no certainty of satisfactory results.

About this time our foreman toolmaker, whose life was being shortened by worry over the job, came across with an idea that was at once simple and practical, and when worked out was found to give us a production of five or six pieces per hour.

A hacksaw blade was reduced by grinding to a thickness of 1/64 in. and to a width of a trifle less than ¼ in. Steel blocks were then welded to each side of the blade at each end, to act as anchors; these blocks at one end were filed to form a round of less than ¼ in. to pass through the bore.

A hole in each jaw of a 20-in. shaper vise provided for slotted posts, in which the blade could be set and tightened by opening the vise slightly. An angle plate attached to the face of the shaper ram in place of the clapper block held the work.

The operation, then, was to thread the blade through the hole in the hub, fasten the work to the angle plate, set the saw in the slotted posts and stretch it by giving the vise screw a backward turn. The shaper was then started and the work fed down to the saw a few thousandths at each stroke by means of the vertical feed screw.

The resulting slots, though in this case only to provide clearance for a wire that was to pass lengthwise of the shaft held in the hubs, were plenty good enough for any purpose requiring a spline or keyway. The tool cost was but a fraction of the cost of suitable broaches and the rate of production was at least equal to what could have been obtained by broaching.

Wooden Plugs in Loose Pulley Bushings

By ELLSWORTH SHELDON

On page 1049, Vol. 55, of the AMERICAN MACHINIST, there appeared an article under the heading "That Loose Pulley Nuisance Again." It described how a certain New England shop had adopted the expedient of chambering out the hubs of loose pulleys and lining them with bushings that had been prepared by drilling radially through them a large number of small holes and then plugging the holes with red oak wood.

This article evoked a letter from the Carlyle Johnson Machine Co., Manchester, Conn., which adds corroboration to the oft repeated statement that there is "nothing new under the sun." It seems that the above company applied this feature to the hubs of some special clutches as far back as 1902, it being, so far as they know, original with them. Such bushings are still listed in their catalog as part of their special equipment.

I am indebted to Mr. Simon of the Carlyle Johnson company for the information that the early experiments of his firm covered a number of different kinds of wood. Starting with white pine it was soon discovered that the pores of this soft wood were too easily closed by the pressure caused by driving the plugs into the holes and soon became clogged. Other woods, both hard and soft, were tried until mahogany was settled upon as the best medium. Rattan is considered a good material to use with heavy oils, though the open grain is very apt to deliver the lubricant too freely when medium or light oils are used.

When running at high speeds the oil is held by centrifugal force against the outer walls of the chamber and the wooden plugs soon cease to deliver lubricant to the bearing surfaces. To forestall trouble from this cause the company packs with grease the hubs of such high speed clutches as have this form of bearing.

Broaching with a Bearing Ball

BY AMOS FERBER

Charles E. Frank, on page 225 of AMERICAN MACHINIST, advocates the use of a steel ball for sizing holes in small parts, particularly drawing dies, and claims that he secures superior finish and greater accuracy of duplication thereby.

Does Mr. Frank size the holes in drawing dies in this manner *after* the dies are hardened, or does he lap them to size after hardening in the same way that the rest of us do? If the latter is the case what advantage does the ball method possess over the reamer, either in size or in finish?

Built-up Cylinders for Knitting Machines

By Leonard H. Anderson

The "cylinder" of a knitting machine that uses latch needles is an annular ring of steel varying in diameter with the size of the machine, and to some extent in

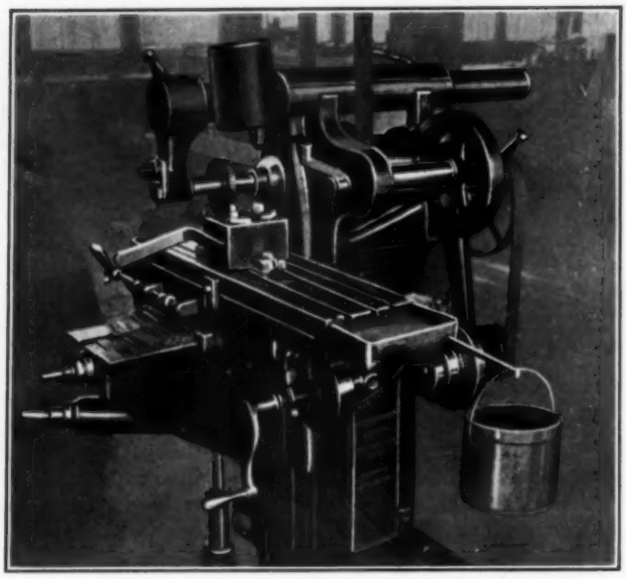


FIG. 1. MILLING INSERT BLADES FOR A KNITTING MACHINE CYLINDER

length with the nature of its product, but all have the common characteristic of being cut around the periphery with small, closely-spaced, rectangular-shaped slots or grooves in which the needles slide.

In addition to the difficulty of spacing these slots accurately and making them of exact size to allow the needle to move freely without side shake, the rings must be hardened in order to resist the wear caused by the rapid movement of the needles. If even *one* of the divisions between the slots is cracked in hardening, or becomes broken in service, the whole ring is out of business.

To avoid the loss that results from such breakage the Scott & Williams Co., manufacturer of knitting machinery, has designed a cylinder in which the slots, instead of being cut into the metal wall of the ring, are formed

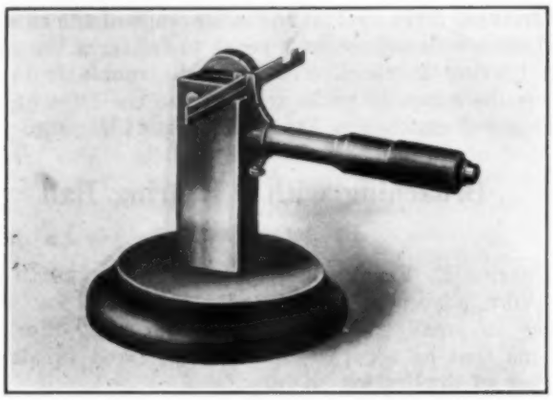


FIG. 2. GAGING THE BLADES FOR THICKNESS AND CONTOUR

by the insertion of steel blades, or dividers, any one of which may be removed from the cylinder if broken and a new one substituted.

The new ring is cut as before, but the surface of the ring, instead of being the outside diameter of the completed cylinder, now forms the bottoms of the needle slots, the blades being inserted in the cuts made in the walls of the ring and held by soldering.

Setting parallel blades into radial slots in the ring would not, of course, produce a rectangular groove; it would be wider at the top than at the bottom. To overcome this, the rings are offset in the cutting machines so that one side only of the slot is radial, and one side of each blade is beveled inward in the making so that when set in adjacent slots the beveled side of one blade becomes parallel to the straight side of its neighbor.

The blades are beveled, two at a time, in the fixture shown in Fig. 1. This is a block of steel with its upper surface beveled inward from both sides to correspond to the angle required on the blades, and provided with gage pins and clamps so that two pieces may be held at once. Thus no bevel is required upon the cutter. A single standard side-milling cutter passes over the work and produces the necessary shape upon both pieces at one pass.

The diameter of the cutter is of no importance except that it must be large enough to allow the milling machine arbor to pass over the clamping bolts of the fixture. Its width must be correct and the corners kept sharp. Thickness of the blade is determined by the vertical setting of the knee of the machine and maintained by constant gaging.

One of the gages used for this purpose is shown in Fig. 2. It embodies the principle of the micrometer but carries a pair of jaws similar to those of a vernier caliper. One of the jaws is beveled to match the bevel of the work so that the tool not only measures thickness but also acts as a check on the contour. Every blade is inspected before it is sent to the assembling operation.

Keeping a Belt Tight

By Hiram Hicks

The problem of keeping a belt tight on a pulley in order to gain driving power, as told by Harold F. Blanchard on page 227 of American Machinist, was "solved" in the same "new and original way" by a millwright in a backwoods Connecticut town fifty years ago.

The belt ran from a wooden drum on the waterwheel shaft in the cellar, to the main shaft of the mill on the floor above; the device was applied to the smaller pulley which was, of course, on the upper shaft. If the "English inventor" could have seen the way it didn't work every time the joint in the belt came around, he never would have had the temerity to invent it again.

Loose belts have a disgusting habit of slipping whenever they want to, and if they can't slip on one pulley they will on the other. The best "solution" for them is a solution of glue or belt-cement, applied with understanding by the belt doctor. If that takes too much time, use a beltlace.

To Blueprint from Typewritten Sheets

By Frank Harazim

To make blueprints of typewritten matter for shop use, place the carbon paper with the coated side against the back of the sheet to be typed. When typing, the impression of the letters will be made on the back of the sheet as well as on the front, making it a good negative for printing.

EDITORIALS

Juggling With the Bonus Problem

THOSE who can hark back to ante-bellum days, when for years the fear of the G. A. R. votes was the nightmare of the politician, tell us that history is repeating itself "in principle," if not in actual occurrence. But we have learned much in the past fifty years. Where can history produce such an amazing juggling act as the last alleged solution of the bonus problem?

The politicians fear the votes of the American Legion, so they propose a bill to pay unknown billions in bonus, in the shape of extra compensation for all who served, whether they ever went into action or not. They also fear the votes of the business men and other taxpayers and so try to frame a bill which will, they think, apparently pay a bonus and yet not cost the taxpayers real money because they postpone final payment for a period of years.

In their frantic endeavor to please both sides they have framed a bill which no sane man can contemplate without wondering whether its framers have developed softening of the brain, or whether they think the taxpayers are all suffering from paresis. Of course, it may be a deep-laid plan to pass some such bill for Mr. Harding to veto, so that the gay and festive "buck" can be passed back to the White House. In either case the man who can retain respect for the lawmakers he has elected, is a peculiar animal.

If we must have a bonus, however, let us be open and frank about it. If the veteran needs and deserves cash let us not give him a certificate which must be pawned in order to raise half of its value. Let us impose a tax and call it by its right name—A Bonus Tax—and from the funds so raised pay a real bonus, not a half-price paper certificate.

The best bonus is a returning prosperity which will give good jobs to the jobless. Any bonus scheme yet proposed will retard the return of business and work to the hardship of all who need employment.

Courtesy Demands An Answer

EVERYONE appreciates a reply to a letter—even if the answer isn't as satisfactory as they might wish. But when a man out of work replies to an advertisement for help and encloses a stamp for reply, the disappointment is rendered more keen by the fact that hope of employment is maintained in vain over a long period.

Answering letters of this kind, after the position is filled, is not a pleasant task. It is one which is put off from day to day until it is often finally abandoned and the whole correspondence consigned to the waste basket. But that is not the right procedure from any point of view. There is a moral obligation which should be heeded. The letters should be answered—and as promptly as possible.

A letter recently received cites numerous instances where applications for employment are not answered even though stamps are enclosed. The writer of this letter has a real grievance and one which can be eliminated by a little more thoughtfulness on the part of those advertising for help.

The insertion of an advertisement of this kind involves numerous replies. Part of the price of securing the right man is the reading of applications from those who do not fill the bill. But the letter from the man who is rejected is entitled to an answer, whether he encloses a stamp or not. It is just as important to know what you do not want, as what you do. And his letter has aided in picking the right man.

To see this most clearly put yourself in the place of the applicant for the job, particularly if you had enclosed a stamp for reply. If you do this, every applicant's letter will be answered. If we put ourselves in the other fellow's place we are pretty apt to do the right thing.

Beware of the Feeling of Complacency

TUCKED away in one of the paragraphs of the leading article is a thought that is likely to be overlooked. It has to do with the feeling which is variously designated as self-satisfaction, cock-sureness or complacency. And a very dangerous feeling this is.

We can all take warning from the experience of the plant manager who was convinced that his shop was developed to a point where further improvement was impossible. Our own particular complacency may not be the result of achievements in shop management; it may be due to social position, financial status, political importance, skill or artistic ability, but it is dangerous nevertheless.

Let us take heed, therefore, before it is too late, and be constantly on the lookout for new tools, new methods, new ideas. Not only that, but let us also make immediate use of what is good in the new things, scrapping if necessary the old idea, method or tool. It will be economy to part with the most cherished of our possessions if by so doing we increase our efficiency and aid the advancement of our civilization.

Insure Aviation Development

IT IS generally admitted that the program of aircraft was largely responsible for the decision to scrap the expensive battleship as a means of national defence thereby saving us large sums in taxation. The remarkable results of the air bombing tests last year gave some idea of its possibilities.

With this in view it is difficult to understand the action of Congress in still further reducing the appropriation for aircraft in both Army and Navy. A reduction from a total of $50,000,000 in 1920-21 to the proposed $32,000,000 for 1922-23 seems hardly credible when we consider that a single battleship represented over $40,000,000.

Aside from the effect on the development of commercial aviation we should not forget that it was the airplane which saved us millions of dollars in taxes. The price of one battleship is surely not too much for planes for both Army and Navy.

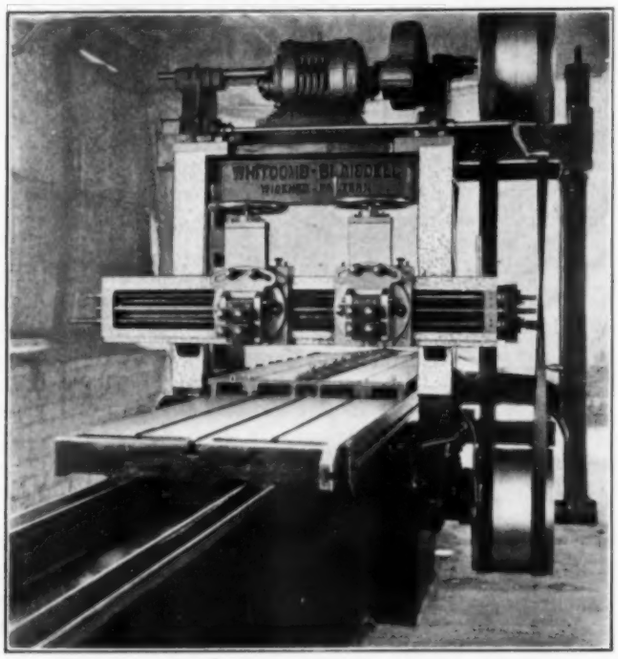
Shop Equipment News

Whitcomb-Blaisdell High-Speed Planer

The accompanying illustration shows a 26 x 32 x 18-in. planer intended for high-speed operation, and recently placed on the market by the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. The table operates at a speed of 150 ft. per minute on both the cutting and return strokes. It is stated that smooth running at the high speed is attained largely because of the second-belt type of drive employed on the machine.

The shaft carrying the tight and loose pulleys that can be seen in the illustration, passes entirely through the bed. At its other end it carries a pulley driving a larger pulley by means of a belt kept tight by an idler. The power is then transmitted through a helical pinion and gear, also on the outside of the bed, to the pinion engaging the rack under the table.

The bed of the machine is cast in one piece. The table contains T-slots, but no holes, and the steel rack extends for the full length of the table. Thirty-inch driving pulleys and shipper motion are provided. Two heads are mounted on the crossrail, both running on the lower screw. The minimum distance between the tools is 12 in. The material planed consists of composition



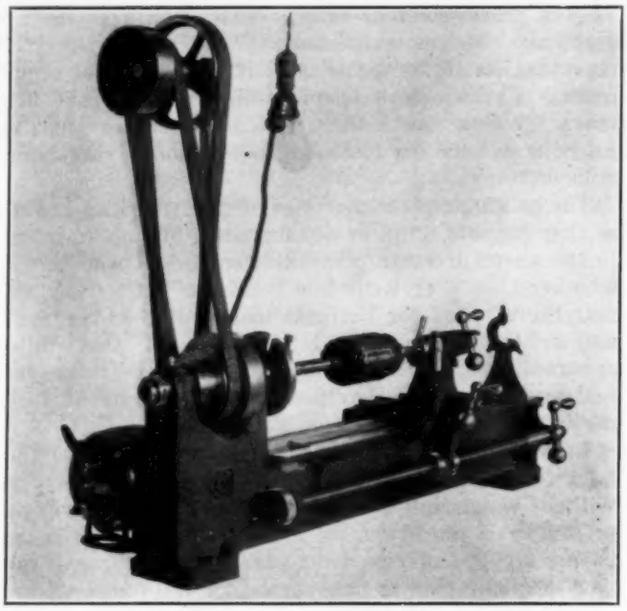
WHITCOMB-BLAISDELL HIGH-SPEED PLANER

brass screen plates about 13 x 30 in. in size. The plates are held in quick-acting fixtures placed two abreast on the table.

Carroll Motor-Driven Bench Lathe

The lathe shown in the accompanying illustration has been recently placed on the market by the A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio.

The countershaft is mounted on a 1¼-in. steel bar fitting in an extension support cast on the bed. The swing over the bed is 10 in. and the distance between centers is 24 in. The spindle has a ⅝-in. hole through it. The carriage is gibbed to the bed and is traversed by



CARROLL MOTOR-DRIVEN BENCH LATHE

means of a long screw at the front of the machine. The feeds are all operated by hand. The motor is attached to the back of the bed and can be operated from an ordinary lamp socket. Voltage and current should be specified when ordering.

The equipment includes motor, cord and plug, faceplate centers, center rest and wrenches, so that the lathe is ready to run without any expenditure for installation.

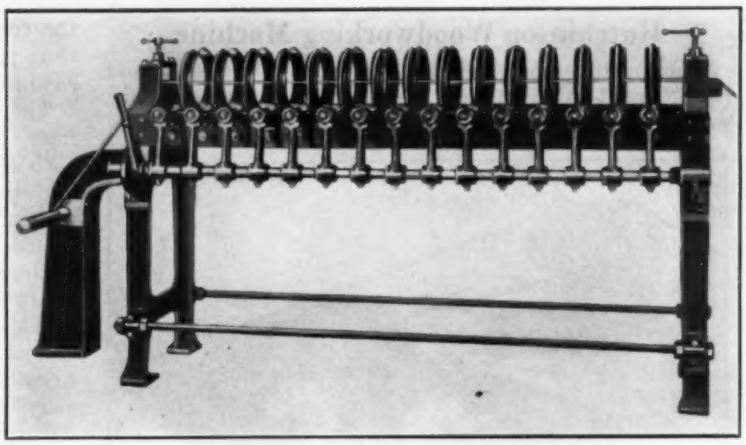
D.&C. Strip-Metal Filing Machine

The machine shown in the accompanying illustration is intended for filing the edges of strip metal. It has recently been placed on the market by the Duston & Clark Engineering Co. Inc., 5225 Superior Ave., Cleveland, Ohio, successors to the D. & C. Engineering Co. The machine is of special use in cold rolling mills, where metal is rolled wider than necessary and then cut into narrow strips and wound in coils. Before this metal is made into springs, hacksaw blades, or such parts, it is desirable to remove the sharp edges. Different classes of work require that the edges be either round, oval or of some special shape.

The coil of metal to be filed is placed on a spool on the spindle shown at the left of the machine. The end of the metal is passed between the two clamps at each end of the table, and then gripped and wound on a power-driven spool that draws the metal through the machine. The power must be applied by a unit separate from the filing machine.

The machine is equipped with fifteen pairs of semicircular heads carrying the files. Each head is mounted

on two rods placed one above the other transversely of the machine. The rear head of each pair is secured to the rods by setscrews, while the front head is a sliding fit and is held in place by the tension of a spring. Each of the heads carries a file holder in which is mounted a file 1¼ in. wide by 2¾ in. long by ¼ in. thick. The positions of the files are adjustable by swinging them around the semi-circular heads and locking them in position. Since an adjustment of 180 deg. is obtainable, it is possible to so group the files as to give the desired shape on the edges of the work. It should be noted that the files operate in pairs, so that the pressure of a file on the work is counterbalanced by a pressure on the opposite side.



D. & C. STRIP-METAL FILING MACHINE

All the heads at the front of the machine can be operated by a lever, so as to pull them forward and open the filing space. To insert a new coil, the operator pulls on the lever, so as to provide clearance and to allow of putting the strip in place by dropping it down between the two heads. The metal passes in a straight line from one end of the machine to the other. The strip metal may be of any gage and up to 3 in. in width. The machine itself is simple in construction, although heavily built, and it can be quickly adjusted and operated. It weighs 1,000 pounds.

"Perfection" No. O Armature Press

The accompanying illustration shows the "Perfection" No. O armature press which has been placed on the market recently by the Naperville Machine Co., Inc., Naperville, Ill. The press is intended for the use of electrical repair men, although its construction and capacity enable it to be employed also for assembling operations on piston bushings, spindle bushings, gears and similar work.

The frame is cast steel, designed to withstand a pressure of 3,000 lb. It is 17 in. in height overall, and the opening in the base is 5 in. in diameter. A hardened steel plate having three different sizes of openings is furnished to accommodate small work. This plate is made of two pieces, held together by two bolts, as shown. The two halves can be slipped together underneath the bearings on an armature shaft so that the shaft can be pressed out of the bearing. The working height between the plate and the bottom end of the arbor in the raised position is 9¾ inches.

"PERFECTION" NO. O ARMATURE PRESS

"Hallowell" Steel Lift-Truck Platform

The Standard Pressed Steel Co., Jenkintown, Pa., has recently placed on the market the "Hallowell" lift-truck platform shown in the accompanying illustration. The device is made of steel and wood, and is designed for great strength and durability. The runners at each side consist of steel angles, the ends of which are bent outward. It is thus very easy to slide the truck between the runners, the flare tending to move the truck sidewise to the proper position. There are no bolts or projections that can interfere with the running of the truck under the platform.

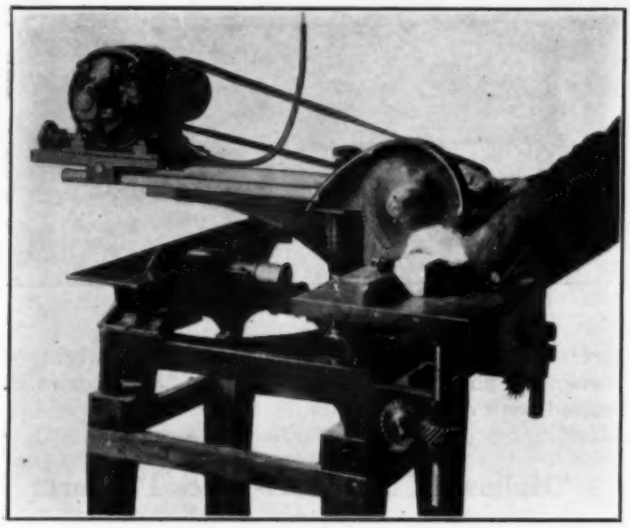
"HALLOWELL" LIFT-TRUCK PLATFORM

The top of the platform is made of wooden planks, which are bolted to the runners with the positions of the bolts staggered. This construction increases the rigidity. All nuts are provided with lock washers. The wooden top is stated to be preferable to a steel one, as the load is not apt to slide off it; it does not dent and deform as steel plate does, and it is easily renewable after it has been marred or weakened by rough usage or wear.

Steel sockets are riveted to the runners for holding the legs. Wooden blocks are inserted in these sockets and bolted in place. The action of these blocks is not detrimental to the floor, as would be sharp edges of metal rested directly on the floor. The chief reason for employing wooden legs is, however, the fact that their use enables speedy changing of the height of the platform. Blocks of different lengths can be furnished, so that the platform can be adapted for use with the type of truck that is employed. The construction provides a serviceable and sturdy platform of simple construction and light weight.

Hutchinson Woodworking Machine

The machine shown in the accompanying illustration is intended for general woodworking use, and has recently been placed on the market by the Hutchinson



HUTCHINSON WOODWORKING MACHINE

Manufacturing Co., Norristown, Pa. The machine is intended for mounting on a bench or stand, and can be easily moved about the shop. It is adapted to a great variety of woodworking operations. It carries an 8-in. cross-cut saw, an 8-in. rip saw, jointer, boring and mortising attachments, a miter board and other devices.

The machine is operated by a ½-hp. electric motor that can be driven from the lighting circuit on either direct or alternating current. The motor is mounted on a slide that can be swiveled so as to bring the pulley into the proper position for driving whatever part of the mechanism it is desired to operate. When connected to the cross-cut saw, it swings and slides simultaneously with it.

The machine can operate on hard wood up to 2 in. in thickness. In a pattern shop, it is especially useful for grooving out core boxes, for cutting accurate joints for segment work, for small planing and ripping, and for making miters accurately at any angle. Its particular advantage lies in the fact that it enables the performing of small jobs with much greater speed than is obtainable by hand, and without the necessity of employing a large machine.

When the cross-cut saw is used, the motion is straight and not in an arc as with a swing saw. The miter box can be set at any angle, and the dadoing machine is in full view of the operator. The saws run at a speed of 4,200 r.p.m., and the jointer at 4,800 r.p.m. Both the rip-saw and the jointer operate at the same time, so that two men can work simultaneously. The table tilts for ripping bevels. The machine requires a bench space of only 18 x 24 in., and weighs 240 pounds.

Manley Portable Hoist

The portable hoist shown in the accompanying illustration is intended primarily for use in garages. It has recently been placed on the market by the Manley Manufacturing Co., York, Pa. The frame of the hoist is made up of steel angles, braced and riveted so as to provide a rigid unit. It is mounted on casters, so that it may be easily moved to any part of the shop. When not in use, the two legs at each end may be folded close together, thus permitting the hoist to be leaned against the wall so that it occupies very little floor space.

The principal feature of the hoist is in the arrangement of the lifting chains. Two chains are provided, each operating independently, so that either one or both may be used at one time. The chains are mounted on drums on the horizontal hexagon shaft at the top of the frame. These drums may easily be slid to any position desired, so that the chains always pull vertically. The shaft at the top of the frame is turned by means of a crank operating through a chain and spur gears.

Due to the fact that one end of each chain can be uncoupled, two speed ratios are provided. When the auxiliary pulley is attached to the load, the speed of lifting is half of that obtained when the load is suspended directly from the chain. The leverage when the auxiliary pulleys are used is 400 to 1, and without them 200 to 1. A pawl engages the teeth of one of the large gears, so that the load may be held in any position desired. The height is adjustable by ⅛-in. steps. When lowering the load, a friction brake acting on the chain-pinion shaft is employed.

The hoist is adapted to many uses, such as removing motors from chasses, removing bodies, or elevating one end of a car so that work may be done underneath the chassis. The frame is long, so that there is plenty of room for the mechanic to work around the machine. The hoist shown, having a capacity of 4,000 lb., has a width inside the legs of 8 ft. and a height of 7 ft. 9 in. It weighs 450 lb. If necessary, it can be furnished with a height of 9 ft. Two sling chains are furnished for attaching to the motor or chassis to be lifted.

A larger size of hoist having a capacity of 8,000 lb. is made for work on heavy commercial trucks. In this case, the two lifting chains are carried on trolleys which automatically position themselves over the center of the load. The chain is wound on a winch at one end of the frame. Two speeds of lifting are provided, one gear-driven and intended for rapid lifting, and the other worm-driven for handling heavy loads. Either method may be engaged without employing any wrenches. A

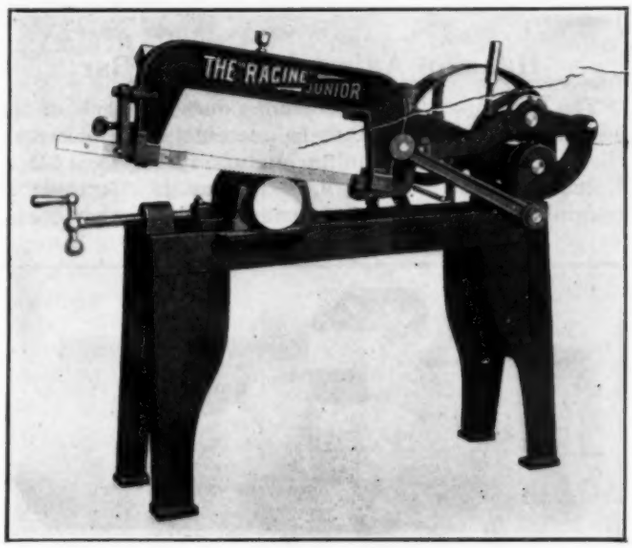
MANLEY PORTABLE HOIST FOR GARAGE USE

brake and locking device are also provided. This hoist has a width of 9 ft. inside the legs, a height of 9 ft., and a weight of 1,000 pounds.

Racine Junior High-Speed Metal-Cutting Machine

The Racine Tool and Machine Co., Racine, Wis., recently added to its line the "Junior" high-speed metal-cutting machine shown in the accompanying illustration. The most important points with regard to the machine are the high speed and the use of light-gage blades. The saw runs at a speed of from 60 to 100 strokes per minute, the strokes being 6 in. in length. Twenty-one-gage blades from 10 to 12 in. long are employed.

It is stated that the high speed is made possible by the positive mechanical lift on the non-cutting stroke. Thus, clearance for the teeth is given on the back stroke to prevent dulling them and dragging the blade. The cut is taken on the draw stroke. The pressure is applied to the saw blades by gravity. An automatic knock-out



RACINE JUNIOR METAL-CUTTING MACHINE

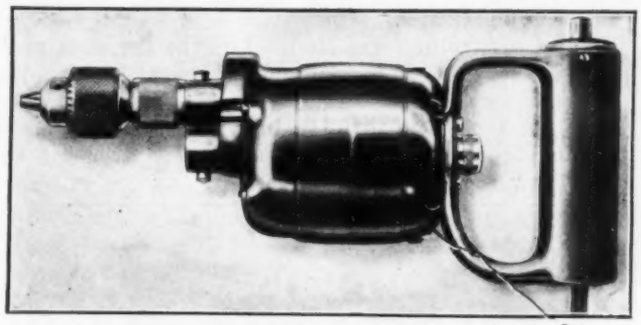
is provided to stop the saw when the cut is finished. The thinness of the blades and the rapid stroke are stated to give unusual economy in blades, time and material.

The saw frame guide holds itself automatically at any height to which it is raised, thus permitting the inserting of stock in the machine. The saw frame slides on V-ways. Means are provided for quickly adjusting the guides for wear. The normal capacity of the machine is 4 x 4 in., but an adjustment is provided by which it can be increased to 6 x 6 in. for occasional large jobs. The height to the top of the table from the floor is 20 in. The floor space is 38 x 12 in. The weight of the machine is 150 lb. net and 180 lb. crated.

Jones Portable Electric Drill

The Consolidated Instrument Co. of America, Inc., 41 East 42nd St., New York, N. Y., has recently placed on the market the portable electric drill shown in the accompanying illustration. The device, which was designed by Joseph W. Jones, is intended for general light work and has capacity for easily driving a ¼-in. twist drill. It is equipped with a universal high-speed motor operating on either direct or alternating current, the latter having from 25 to 60 cycles.

The housing of the motor is made of aluminum and finished in black. The diameter of the motor is 3 in.



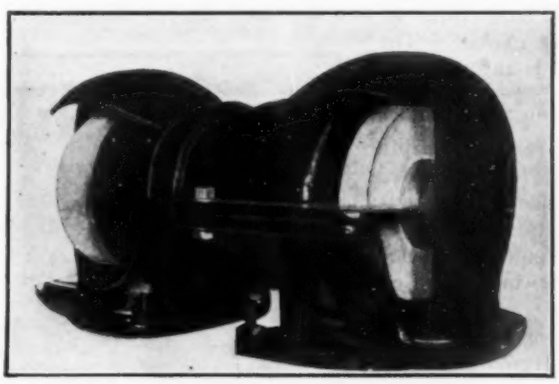
JONES PORTABLE ELECTRIC DRILL

The shafts are ground to size; the gears are made of heat-treated tool steel, and have helical teeth. The spindle carries a No. 1 Jacobs chuck. The end thrust of the drill spindle is taken on ball bearings. The device is furnished with 10 feet of electric cord, plug and switch. The drill is 10 in. in length overall. Its net weight is 4 lb., while the shipping weight is 7½ pounds.

Forbes & Myers Bench Grinder with Self-Contained Exhaust Fan

Forbes & Myers, Worcester, Mass., have recently developed a bench grinder, illustrated herewith, having as a component part provisions for removing the dust caused by the grinding. Outside the bearings are located centrifugal fans which blow the dust directly back through the exhaust pipe connected at the rear of the grinder. No separate motor and fan are required. This method of exhausting the dust is for use with single machines when it is possible to conduct the dust directly outside. However, it is not intended to replace large exhausting systems, as it does not have sufficient power to carry the dust through long pipes with many turns.

The motor is of the induction type and fully inclosed. It is made for single, two or three phase alternating current, and in ½ and ¾ hp. sizes. Inclosed Hess-Bright ball bearings are employed. The fans and the two



FORBES & MYERS GRINDER WITH EXHAUST FAN

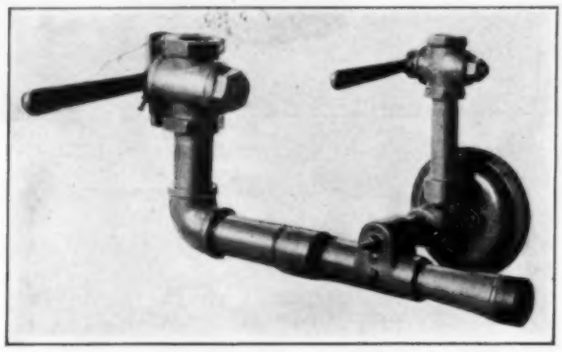
grinding wheels are located outside the bearings. The wheels are well guarded. Adjustable toolrests can be located either at one or at both ends.

Surface-Combustion Low-Pressure Air-Gas Inspirator

The Surface Combustion Co., 366 Gerard Ave., Bronx, New York, N. Y., has recently placed on the market the low-pressure air and gas inspirator shown in the accom-

panying illustration. The device is a redesign of the style of inspirator formerly used on the furnaces made by the company. It is adaptable to any make of industrial gas furnace.

The maker states that the inspirator is essentially a gas-furnace carburetor. The entire operation of the



SURFACE-COMBUSTION LOW-PRESSURE INSPIRATOR

furnace equipped with the inspirator is controlled by means of one valve. The gas cock is used only when starting or stopping, and is either entirely closed or entirely open. An increase or decrease of the air supply automatically changes the amount of gas used, so that the proportions of the mixture remain the same.

It is said that no explosive mixture is possible in any part of the distribution mains of the system, as the gas and air are mixed only at the point of supply to the burners. A supply of the mixture is automatically maintained at the furnace under all conditions of operation. The fluids are thoroughly mixed just prior to entering the furnace, so as to provide a homogeneous gas and to give instantaneous combustion.

Tuban Cotter-Pin Puller

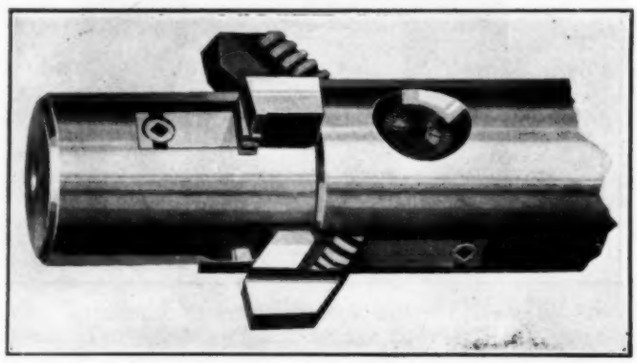
The accompanying illustration shows a device recently placed on the market by the Tuban Manufacturing Co., 9137 One Hundred and Eleventh Street, Richmond Hill, New York. The tool is intended for pulling cotter pins, and is shown in use removing a pin from a bolt in a connecting rod. The size shown is for pulling pins up to ½ in. in diameter, although a larger one is made for removing pins up to ¾ in. in diameter. The chief merits of the tool are the speed that is possible in removing pins, and the ability to reach pins in places difficult of access. It is not necessary to straighten the ends or legs of a pin before using the puller. The lifting point is merely hooked in the hole at the head of the pin, and the two handles of the puller squeezed together. The leverage permits of easily pulling the pin out of the hole. It is stated that the average pull required to remove a ¼-in. cotter pin, the legs of which have been spread, is between 150 and 200 lb. This pull is sufficient to itself straighten the legs. In order that the tool may have sufficient strength for removing the pins, each one is tested to withstand a pull on the point of 400 pounds. The motion of the movable or lifting point is about 1 inch.

TUBAN COTTER-PIN PULLER

The lifting point is made of tool steel, hardened and drawn. The two handles or lever bars are made of ⅛-in. sheet steel formed to shape and then casehardened. The parts are riveted together. The end of one bar is drawn flat and shaped to a screwdriver point. It is thus of use in spreading the ends or legs of cotter pins after they have been put back in place in the bolts.

Hannifin Adjustable Boring Bar

The accompanying illustration shows one style of the adjustable boring bar that has recently been placed on the market by the Hannifin Manufacturing Co., 621 S. Kolmar Ave., Chicago, Ill. The bar is adaptable to rough-boring, finish-boring, reaming or any other operation where boring bars are used. It has a small number of operating parts.



HANNIFIN COMBINATION ADJUSTABLE BORING BAR

The cutters can be set out or withdrawn by turning the scroll, which is graduated so as to aid in setting them. After the cutters are set, the locking screw at each side is tightened, thus forcing a wedge-shaped locking block forward and holding the cutters firmly in position. There is no strain on the adjusting mechanism during cutting.

Either straight or angle-type cutters can be used, or a combination of both can be made in the same bar. The angle-type cutters are particularly adapted to facing and counterboring operations, because they adjust forward when increasing the diameter. Continual setting out and grinding will leave the forward cutting edge in its original position. Angle-type cutters also allow boring to the bottom of a "blind" hole.

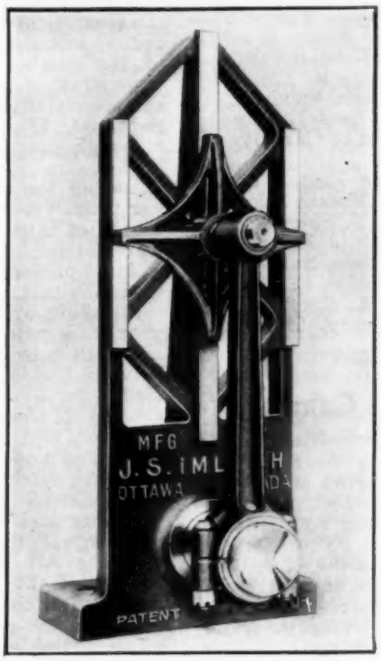
The combination of straight and angle-type cutters enables the boring of different diameters, counterboring or facing simultaneously. If desired, the cutters can be adjusted to cut on a common line, making the bar a four-point cutting tool. A number of combinations of cutters can be incorporated in the same bar. A long tool is obtained by making the cutters overlap at the inner ends. Although the cutters are heavy, the amount

of stock cut from the boring bar is comparatively small. Its strength is thus not reduced.

For rough- and finish-boring cylinders, line-boring and reaming crankcases, and similar work, bars can be furnished with removable block-type cutters. The cutters can be set to size before inserting them in the bar. The rough-boring blocks, finish-boring blocks and reaming blocks can be quickly inserted and removed in succession, using the same bar for all operations. The adjusting and locking mechanisms are included in the block, the only extra mechanism being a lock by which the block is held in the bar. The block can be locked solidly, or it can be secured so as to allow a movement of 0.008 in. for float reaming. A grinding fixture can be furnished for the block-type cutter bars, by which the cutters can be ground so that they will align perfectly when locked in the bar.

Imlach "Twistest" Connecting-Rod Gage

The illustration shows a device recently developed by J. S. Imlach, 324 Catherine St., Ottawa, Canada, for testing automotive connecting rods. The device is known as the "Twistest" gage, and enables the proper aligning of the two bearings on the ends of the rods. The frame of the device is bolted to the bench, as it is not necessary to move it. The ribbed structure above the base has three narrow vertical surfaces accurately ground in a plane at right-angles to the axis of the bore for the mandrel in the base. This bore is provided with a hardened and ground bushing. Separate hardened and ground mandrels are used for each size of crank bearing on the connecting rod. At one end, the mandrels are all of the same diameter, so as to fit the hole in the base of the frame. The indicating device is attached to the wristpin end of the connecting rod. It consists of a hardened and ground arbor fixed in a casting having four arms, the ends of the arms having ground surfaces lying in a plane at right-angles to the axis of the arbor.



IMLACH "TWISTEST" CONNECTING-ROD GAGE

The rod to be tested is clamped to the mandrel and to the indicator. When the mandrel is placed in the frame, the way in which the indicator makes contact with the frame is noted. Since light is admitted through the open frame, it is easily possible to ascertain how many of the points are making contact. The device indicates at one setting the accuracy of alignment of the rod in both directions. Since the length of the arms of the indicator is greater than the length of the wristpin, any error occurring in the alignment is magnified. It is stated to be possible to detect errors in the rod of 0.00025 in. The use of feelers is unnecessary.

The device is of use when scraping bearings, and serves as a jig. In this case, the rod is fastened to the indicator, but is not clamped to the mandrel. It is tested from time to time on the mandrel as the scraping progresses. The final fitting is, of course, done on the crankshaft itself. The device is also of use in testing the alignment of the piston when the piston and the rod are assembled. The standard device is adaptable to rods from 6 to 12½ in. long between centers. Interchangeable mandrels up to 2¾ in. in diameter and indicator arbors up to 1¼ in. in diameter can be supplied.

Diamond Universal Hob for Cutting Sprocket Teeth

The universal hob for cutting sprocket teeth, that was described on page 350 of AMERICAN MACHINIST, is not manufactured nor sold by the Diamond Chain and Manufacturing Co. of Indianapolis, Ind., although it was developed by that concern. The hob can be supplied by the Brown & Sharpe Manufacturing Co., Providence, R. I., the Illinois Tool Works, Chicago, Ill., and the Union Twist Drill Co., Athol, Mass.

Machinery and Power Our Slaves

A scientist in the Smithsonian Institute at Washington has figured that the use of power and machinery gives to every man, woman, and child in this country the equivalent of 30 slaves. In other words, he says, take away all our machinery and steam and electric power and it would require three billion hard-working slaves to duplicate the work done by Americans of today with the use of these modern inventions.

Why envy the nobleman, back in ancient Egypt or Bagdad, with thirty slaves toiling for him?

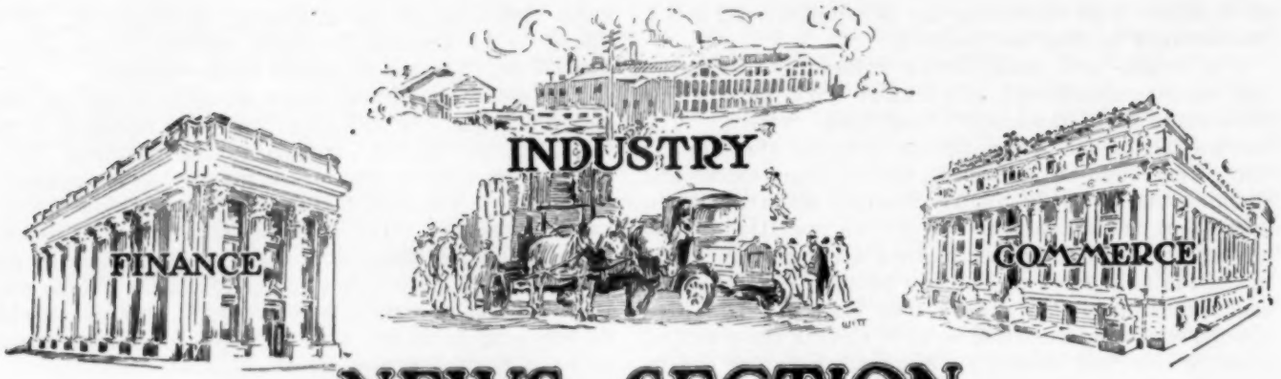
He had swift-running slaves bring him fish from the ocean and bird tongues from the mountains. Today, with a few dimes, you can get a tin can of shrimp brought from Japan, a bag of nuts from Brazil, a can of sardines from Norway.

Your slaves—machinery and power—bring them.

Your real wealth is measured, not in money, but in the number of things you obtain to eat and wear, the ease with which you get them, the comforts and conveniences of your home, methods of transportation and amusement.—*Plainville (Col.) Republican.*

Air Service in Mexico

Commercial aviation is rapidly expanding, and thus giving proof of the increasing importance of this branch of the automotive industries. The Secretary of Communications of Mexico, according to *El Campo* of September, 1921, has made arrangements with a foreign company with a view to establishing an aerial transportation service for passengers and cargo between Mexico City and Tampico. The operating company made the first trip with passengers, mail, and cargo on Sept. 1, taking 2½ hours from Mexico City to Vera Cruz and 1 hour from Vera Cruz to Tampico. When the shipment of the fifteen machines arrives, the services will be extended to include San Luis Potosi, Monterey, Laredo, and Matamoros. A special service will be established between Tampico and Laredo.—*Commerce Reports.*



NEWS SECTION

Railroads Show Poor Financial Returns in 1921

The financial results of operation in 1921 by the 201 Class I railroads in the United States are shown in a report just presented to the Interstate Commerce Commission by the Association of Railway Executives.

These railroads had a net operating income of $615,625,619, which was at the annual rate of return of 3.31 per cent on their tenative valuation. This income hardly more than covered the interest charges and rentals alone, these items amounting to $603,000,000 in 1920 and more than that in 1921. Fifty-four railroads, consisting of 26,022 miles of track, had operating deficits in 1921, the deficits for those roads totalling $29,114,000. Operating revenues totaled $5,569,888,000, a decrease of 10.6 per cent compared with the total in 1920. Operating expenses for the past year amounted to $4,602,425,000, which was a decrease of 21.1 per cent compared with the year before.

Australian Railways Not to Standardize Track Gage

Unification of railway gage in Australia has been dropped for the present by the conference of states premiers with the Federal Prime Minister, according to reports from Melbourne, Australia. The report of the Royal Commission on the matter of uniform railway gage compiled under direction of the Commonwealth Parliament, and published October 12, 1921, shows that in Australia there are now 12,686 miles of railways of 3 ft. 6-in. gage, besides many miles built to other gages. The commission has recommended the conversion of all railways to the 4 ft. 8½-in. gage as a standard, and the first installment would involve, it is estimated, an outlay of £21,600,000.

Belgian Iron and Steel

Belgium's iron and steel production figures for January, 1922, have just been received by the Department of Commerce cable from commercial attache William C. Huntington, of Brussels. The totals for the month are stated to have been: Pig iron, 94,210 metric tons; raw steel, 76,450 tons; rough steel castings, 3,240 tons; finished steel 83,300 tons; finished iron 15,082; Spelter was produced in the amount of 8,250 tons.

A. W. Whitney Elected Chairman of Standards Committee

At the annual meeting of the American Engineering Standards Committee, held in New York on Feb. 9, Albert W. Whitney, a representative of the National Safety Council was elected chairman. George C. Stone, a representative of the American Institute of Mining and Metallurgical Engineers, was re-elected vice-chairman. Mr. Whitney is associate general manager of the National Bureau of Casualty and Surety Underwriters.

The following were elected on the executive committee: Martin Schrieber, Sullivan W. Jones, C. E. Skinner, E. A. Frink, Eugene C. Peck, John A. Capp, A. H. Moore, N. A. Carle, Dana Pierce, A. Cressy Morrison, Coker F. Clarkson, T. H. MacDonald, G. K. Burgess, O. P. Hood, Francis J. Cleary, Beverly C. Dunn.

Rehabilitation Campaign

The Merchants Committee of the Bridgeport, Conn., Chamber of Commerce, is making a survey of all available manufacturing space in the city, with a view of bringing additional industries to Bridgeport. The campaign was started recently by the Chamber of Commerce to get a line on all the war-time factories, now idle, and bring other peace-time concerns to take them over. The business men of the city have pledged several thousand dollars to support the campaign.

Chance for American Machinery in Ireland

An excellent opportunity for American manufacturers of agricultural machinery to introduce their equipment in Ireland will be afforded by the annual agricultural spring show of the Royal Dublin Society, to be held at Ballsbridge, Dublin, on May 16 to 18. This show is attended by practically all those who are interested in agriculture in Ireland, and it is believed that substantial sales of American implements and machinery will follow, if these products are on display. Allocation of sites for exhibits will be made soon. Interested American manufacturers should apply promptly to the secretaries of the Royal Dublin Society, Dame St., Dublin, Ireland, for rates and conditions governing the exhibition.

British Air Service Grows with Government Aid

The British Air Ministry's report for the six months ended Sept. 30, 1921, has just been received by the Department of Commerce from Consul Reed at London. It shows that fewer passengers and less tonnage were carried by air in the summer of 1921 than in the two preceding summers. From the standpoint of the number of passengers carried, the period from the inauguration of commercial flying on May 1, 1919, to Sept. 30, 1919, was the most active, although most of these were local flights.

During the summer of 1921, passenger traffic reached its height during the month of August, when 9,609 persons were carried, of which 2,021 were cross-channel passengers, mainly residents of Great Britain and France.

Sudsidies amounting to £200,000 per year, now paid by the British government, to provide a regular air service between London and Paris, will be continued for some months. A permanent scheme of subsidies is contemplated, however, and it is now proposed that the government shall pay to certain approved British firms operating a cross-channel air service with British machines and engines, a subsidy of 25 per cent of their gross earnings, and that the Air Ministry shall provide a portion of the fleet on a hire-purchase basis at less than cost price.

During the past year certain features of air navigation have been more or less standardized. All British machines operating on cross-channel routes are now fitted with wireless apparatus, and under the new air navigation order this will be made compulsory for all machines capable of carrying ten or more passengers. The stations at Croydon and Pulham have been provided with wireless direction finding stations which work together and enable aircraft to ascertain their positions. Experiments are being made with various pyrotechnic devices and colored searchlights for directing aircraft to aerodromes in fogs or mists.

Machinery in China

Director Klein of the Bureau of Foreign and Domestic Commerce states that the development of factories in China and India has created new markets for American machinery and general equipment. Two million dollars worth of machinery was sold to cotton factories in China through efforts of the bureau.

Technologic Papers in Book Form

Beginning with Technologic Paper No. 203, the Bureau of Standards of the Department of Commerce, will issue volumes of 750 pages each, containing consecutive reprints of these papers. This will enable libraries and schools to keep an accurate and complete copy of each series.

The volume will be uniform in style and size with that of the scientific papers of the Bureau of Standards. Since so few copies are available for free distribution, it is no longer possible to complete all the sets from the beginning. The Superintendent of Documents maintains a sales stock which will help to complete back sets, and he reprints any publication for which there is sufficient demand.

The suggested grouping of technologic papers into volumes need not be followed by libraries which classify the papers on the shelves by subjects, but the suggested grouping will be convenient for those libraries which maintain the series in consecutive order as sent out.

A title page and index (issued separtely) will be transmitted with the last Technologic Paper of each volume to those libraries or subscribers who receive the complete series.

Subscriptions can be placed for the series of technologic papers by sending written orders addressed "Superintendent of Documents, Government Printing Office, Washington, D. C.," and inclosing $1.25 to cover a sufficient number of the papers to make one volume. Separate numbers of the technologic papers may be purchased at nominal cost by sending to the same address.

Circular 24 contains a descriptive list of all Bureau of Standards publications issued since the establishment of the Bureau. An extended abstract shows clearly the nature of the subject matter and gives in many cases a brief summary of the result. This list will be distributed to applicants free of charge.

Mrs. Roebling a Director

Mrs. Blanche Estabrook Roebling, widow of Karl G. Roebling, of Trenton, N. J., has been elected a member of the board of directors of the John A. Roebling's Sons Co., of which her husband was president. Mrs. Roebling is a daughter of Henry D. Estabrook and is an able business woman. She is believed to be the only woman in the United States who occupies a position in the directorate of a business concern of such proportions. Mrs. Roebling and William Gummere, superintendent of the steel mills, succeed as directors Scott Scammell, of Trenton, and Herbert Noble, of New York.

Inspectors' Bulletin

The American Society of Mechanical Inspectors will publish a monthly bulletin containing news of the society and information relative to the furtherance of mechanical inspection. The first issue of the bulletin will appear this month. The paper will be issued from the society's headquarters, 29 West 39th St., New York City. H. M. Spitzenberg, secretary of the society, will be in charge.

Chamber of Commerce Against Certificate Bonus

The following statement was issued last week by Joseph H. Defrees, president of the Chamber of Commerce of the United States, with reference to the proposed certificate plan, at this writing the latest proposal for paying the soldier bonus:

"A general bonus paid through certificates is just as objectionable, from the point of view of the Chamber of Commerce of the United States, as such a bonus paid in cash. The organizations participating in the national chamber's referendum which closed on Feb. 21, were as unmistakable in their opposition to a certificate plan as to a cash plan. They cast 1,221 votes against a general bonus in either form, and only 467 votes in favor.

"The chamber's opposition is to a general bonus, however paid. The chamber has not opposed a bonus merely on account of the amount of money that is involved. Attention has been called to the money requirements because of their importance and the financial problems and consequences they entail. Similar reasons demand public attention to the plan now being considered by a committee of Congress. This plan calls for "certificates" payable in twenty years or at death, in an amount equal to a cash bonus increased 40 per cent, and by compound interest, these additions being on account of postponement. Consequently the face value of certificates payable in twenty years will be about three and one-third times a cash bonus if paid now. Under this plan the Government would have to provide five billion dollars over a period of twenty years, with somewhere around a billion dollars for use in 1925 and the greater part of the rest in 1943. These obligations are in effect proposed in substitution for a cash bonus estimated, if every ex-service man took cash, at a billion and a half paid over the years 1922 and 1923. In the two years before 1925 when the Government would have to find about one billion dollars there are upwards to six billion dollars of debt to be paid or refunded. That a requirement of one billion dollars more will have serious consequences is obvious.

"Some features of the certificate plan now under consideration by the House Committee on Ways and Means are even more objectionable than the original bonus bill. It is proposed that certificates should be used as collatoral for loans at banks and such loans should be rediscounted at the Federal Reserve Banks. Such a purpose means return to war conditions under which the reserve banks held large amounts of loans secured by government war obligations. One of the problems of readjustment has been to get this paper out of the reserve banks and other paper of similar kind out of other banks. Great progress has been made, but this progress will be undone by the new proposal.

"Loans of this character have no place in the commercial banking system. They found their entry only in a war emergency. No loans should go into the federal reserve system except such as are speedily and surely self-liquidating. Violation of this principle means inevitable inflation and other evils which are sure to follow violation of sound banking principles."

Machinists and Toolmakers in Census Reports

Figures being compiled at the Bureau of Census, in Washington, show a consistent shifting in the mechanical forces of the country in the last ten years. A comparison of a few of the cities follows:

Oakland, Cal., had 3,689 machinists and toolmakers in 1920. This is an increase fron 1,174 in 1910. There were 381 mechanical engineers in Oakland in 1920, as compared with eighty-six in 1910.

New Hampshire had 4,592 machinists and toolmakers in 1920. This shows an increase from 3,471 in 1910.

Montana had 2,198 machinists and toolmakers in 1920. This is an increase from 1,251 in 1910.

Idaho had 1,472 machinists and toolmakers in 1920. This compares with 740 in 1910. The 1920 census shows that South Dakota has 1,724 machinists and toolmakers, an increase from 516 in 1910.

Utah had 2,010 machinists and toolmakers in 1920, compared with 1,120 in 1910. When the 1920 census was taken Arizona had 1,675 machinists and toolmakers. This compares with 757 in 1910.

Pittsburgh had 6,523 machinists and toolmakers when the 1920 census was taken, but only 5,429 in 1910. Delaware had 2,955 machinists and toolmakers in 1920 and 1,641 in 1910. Providence, R. I., had 5,066 machinists and toolmakers when the 1920 census was taken. This compares with 4,510 in 1910. Omaha, Nebraska had 1,228 machinists and toolmakers in 1920, compared with 842 in 1910.

Use of Freight Equipment Shows Business Improvement

The number of freight cars idle because of business conditions totaled 437,678 on Feb. 23, compared with 449, 819 on Feb, 15, a reduction of 12,141, according to reports just received from the railroads of the country by the car service division of the American Railway Association.

Comparisons show that of the total, 264,814 were surplus freight cars in good repair and ready for immediate service if traffic demands warranted. This was a reduction of 13,667 compared with the number of such cars at the middle of the month. The remaining 172,864 were cars in need of repairs over and above the number normally regarded as being unfit for use until repairs have ben made.

Surplus box cars in good order numbered 105,938, a decrease of 6,616 since Feb, 15, while surplus coal cars in good repair totaled 105,570, a decrease of 6,480 within the same period. Surplus coke cars showed a decrease of 104 within approximately a week, while a decrease of 449 was reported for stock cars with the same time, which brought the total down to 20,732.

Of the 2,282,136 freight cars on line on Feb. 15, reports showed 332,614, or 14.5 per cent, in bad order, compared with 331,050 or 14.5 per cent on Feb. 1. Allowing 7 per cent of the cars on line as being normally in need of repairs would leave 172,864 as the number in excess of that amount which are idle and out of repair.

Business Conditions in Germany

BY OUR BERLIN CORRESPONDENT

The decline of business, which immediately set in at the rise of the mark in December, continued in a more pronounced degree during January. Machinery works are still fully employed with the orders booked last fall, which explains why the unemployment rate, the best indication of business conditions, increased slightly in December. In November this rate had dwindled down to the incredibly low figure of 1.4 per cent. For December an unemployment rate of 1.8 per cent was recorded. The January figure is not yet available, but is believed to be somewhat higher. This rate applies to the total of workmen organized in the trades unions, and differs in the various lines of industry. In the machine building and metal industry, for instance, it was only 0.6 per cent in December. New business is coming in rather sluggishly, which in one way is looked upon with some apprehension, but in another seems to be not quite unwelcome to manufacturers. The caution, not to say reluctance, with which orders requiring several months for delivery are treated, is becoming strongly pronounced. The new tax laws, the transitory state of the prices of coal and raw material, which are in a constant upward movement, combined with the unsettledness of the wages, let appear that all price estimates are built upon quicksands.

Unions Want Sliding Scale

A temporary agreement has been reached in several places between manufacturers and the machinists' unions, providing for an increase of the wages at an average of 1.60 marks per hour, but great divergence still prevails between the minds of the two parties with regard to reaching a definite agreement for the current year. The unions are pressing the demand to place the wages on a sliding scale, moving with the index figures for the living expenses, but this is strongly opposed, not so much by the manufacturers, but by the government. Manufacturers maintain that no reliable index figures exist upon which to base sliding wages, and point to the difficulties which would arise if wages would immediately follow all market fluctuations of commodities. There are, however, actually several departments of the government at work to find a solution of this problem, but from the opinions in authoritative quarters it appears that this is only a demonstration of goodwill, without serious intentions. The government is helping to maintain a comparative steadiness of the rate of exchange which might assist in tiding over the difficulty. In view of the stoppage of the mark depreciation, the trades unions seem more amenable to come to terms, although a considerable element of unsettledness prevails, as was exhibited by the recent strikes. New wage tariffs have been concluded in a number of industrial branches at an increase of from 15 to 30 per cent. This is probably the margin inside of which a compromise will be struck with the machinists' unions. The temporary increase of 1.60 marks already allowed brings the machinist's wages up to 11.30 marks for skilled workmen over 25 years of age, which is nineteen times above the pre-war level; and 9.70 marks for unskilled workmen over 21 years of age, or twenty-four times more than in pre-war time.

As the increase of living expenses above pre-war level, according to index figures available, is only 1,600 per cent, the wages paid have already advanced beyond the standard set by the index figures. The high cost of unskilled labor in comparison to skilled labor is one of the sorest points of the whole wage problem, especially as factories are carrying more unskilled labor than in pre-war times. Fettered as they are by the laws protecting the workmen, all attempts to return to healthier conditions are futile, or at the best very difficult.

Prices Going Up

Under such conditions there is no chance of a stop in the price movement, and prices will move upwards. This is in fact disclosed by the conditions prevailing on the market. The weakening of prices following the decline of incoming orders has ceased, and a steady increase on the whole line can be observed, in spite of the slackening of business. The abandonment of hopes in this direction has lately given the market a better tone, at least as far as the domestic market is concerned.

The export business has sunk back into the state prior to the business boom of last fall, and no revival is expected or looked for at present. With the exception of Russia, which is becoming more and more a factor in the market for railroad material and agricultural machinery, all other export business is getting more and more becalmed. The tendency of expansion and re-organization in the German industry, noticeable in all branches, is undiminished and will doubtless continue to find strong expression on the market as soon as the trend, which the political conditions bearing upon the price movement will take, becomes an absolute certainty. The expectations of a radical change of conditions, built upon the forthcoming conference in Genoa, are more and more diminishing, and are giving place to a more sober survey of the possibilities of the new future. Manufacturers cannot see where a reverse of prices could come from, even if Germany obtained all the success at Genoa which her government appears to expect. The present frame of mind of the business world is characterized by a mixture of increasing optimism in the future and a belief that if a change of the financial conditions is on the way it will not take effect for some time to come.

The returns of the foreign trade in 1921, which are now available, demonstrate that the complaints of the machine building industry with regard to the export business are not without foundation. Official export statistics for the months from January to April, 1921, have never been collected; but by substituting informatory figures of the manufacturing associations it appears that the total exports of the machine building industry in 1921 amounted to 350,000 tons compared with 536,000 tons in 1912, and over 600,000 tons in 1913. During the summer months the exports maintained a level of about 35,000 tons per month, which decreased towards the fall to 27,000 tons. A recovery took place in December, in which month 37,000 tons were exported. The shipments in January and February were probably somewhat higher. Prices maintained an average of 16.000 marks per ton, or approximately fifteen times the pre-war level, up to August. They increased during the subsequent months to 25,000 marks per ton, and in December to over 30,000 marks. The rate of exchange was twenty times under parity in August; in November eighty times; and in December forty times. The depreciation of the money is therefore not expressed in the export prices.

If the total of the machines exported remained behind pre-war level, it can be observed that the drop did not affect all classes of machines equally. In many cases the exports compare very favorably with pre-war results, in others they remained considerably below. The locomotive industry enjoyed a fair amount of export business, while the exports of steam and combustion engines were remarkably small. Machines for the textile industry had about 50 per cent of the pre-war exports, and agricultural machinery 75 per cent. The only decided increase above the pre-war level is exhibited in the case of machine tools. This branch of the machine building industry has now acquired a very important position in Germany's foreign trade, and stands second to the locomotive industry. Whereas in pre-war times the machine tool exports amounted to a tenth part of the total machinery exports, nearly a fourth of the 1921 exports comprised machine tools. The year 1921 was a record year for machine tool exports. The total of 1921 was 78,000 tons, and has never before been reached. It exceeded that of the most prosperous pre-war year, 1913, and is considerably higher than any of the other preceding years. Foreign shipments fluctuated in the year between 4,000 tons in May and 8,000 tons in July. In November 4,900 tons were shipped, and 5,400 tons in December.

Export Prices Low

The prices in the first part of 1921 reached their maximum in May, which shows an average export price of 19,600 marks per ton, constituting approximately nineteen times the pre-war price. They dropped in the subsequent months to from 16,000 to 17,000 marks per ton, which level they maintained up to September. The depreciation of the mark, which it will be remembered started in June, is reflected only slightly by a rise in prices. In October 20,000 marks per ton on the average were paid, which figure rose to 25,500 marks per ton in December. From this it is evident that the prices for foreign shipments were only in the

first half of the year somewhat commensurate with the rate of exchange prevailing, while those of the second half were considerably below. The average export price in November, which was 21,300 marks per ton, equals a gold mark price of 300 marks only, which is a little less than a fourth part of the pre-war average. Considering the fact that, according to reports coming from the machine tool industry, most contracts up to October were made on short delivery, the backwardness of prices can hardly be understood. Complaints are frequently made of the clumsy red-tape fashion in which the export control is handled. Although such complaints no doubt are well founded, they do not fully explain the ridiculously low export prices. The fact is that many manufacturers and dealers were over eager to clear their stock and took advantage of the first signs of reviving business. Besides, the instructions issued by the Association of Machine Tool Builders with regard to export prices do not follow the fluctuations of the exchange with sufficient swiftness, and often lag considerably behind exchange movements.

Manufacturers and dealers are fully aware of the insufficiency of export prices, but although the tendency to get as much as possible is strong, sellers are shy to run up their quotations too close to foreign prices, as the bad experience made with such practice in the past is still too fresh in their minds. The association expects better results from the new practice to quote in foreign currency. This has now been regulated for all the metal-working industries. Quotations are made in marks only for exports to the eastern and southeastern European countries; to all others in their own currency or in English, French or Swiss money. This does not guard against dealers in countries with low exchange taking advantage of the mark quotation by shipping goods, ostensibly bought for their country, to other countries, a practice which is not infrequently met with, and which probably explains the comparatively large exports to such countries. Among the countries sharing in German machine tool exports, Belgium and Holland occupy the first place. Their purchases far exceed those of pre-war times. Holland, for instance, bought during the last three months of 1921 more German machine tools than in any one entire pre-war year. While the exports to Belgium and to France are obviously for home consumption, there can be no doubt that tools bought by Holland are partly re-exported.

The slight revival on the home market, following the slackening of business in December and January, is not general but indications lead to the belief that it will spread further. The opinion prevails that while the export market will possibly fall off further, the demand on the home market will continue at its present size, with slight variations in the various branches of the machine building industry. The tendency to expand and to renew existing equipment is noticeable in the whole industry, even in the mining industry where huge investments for new and existing plants are contemplated or are already being carried out. This tendency is still kept in check by the caution with which the coming political developments are viewed.

The Trend of Business Improvement—Plants Resuming

The Gardner Motor Co., St. Louis, Mo., is increasing production at its automobile plant, with a schedule calling for more than 650 completed cars during March. This is considerably in excess of the combined manufacture of January and February.

The St. Louis & San Francisco Railroad Co., St. Louis, Mo., is arranging to double the working force at its shops at Fort Scott, Kan. The works will be devoted to the manufacture of steel bodies for all coal cars used on the system.

The Trumbull Steel Co., Warren, Ohio, has resumed operations on a 100 per cent basis, with normal working force.

The National Axle Co., Benton Harbor, Mich., manufacturer of automobile and other axles, is operating on a capacity basis at its local plant, and has sufficient orders on hand to insure production on this scale for the entire year.

The Pennsylvania Railroad Co., has increased the working hours in the different departments at its car shops at Olean, N. Y., at the same time adding about fifty men to the working force. It is planned to increase the number of employees at an early date.

The Regina Co., Rahway, N. J., manufacturer of talking machines and parts, is being reorganized, and plans to resume operations at its plant before the close of March.

The Ohio Steel Foundry, Lima, Ohio, has adopted a capacity production schedule at its plant, giving employment to about 500 men. The company has secured a large order for railroad castings for the Argentine Republic, insuring full production for a number of months to come.

The New York Air Brake Co., 165 Broadway, New York, N. Y., is maintaining active production at its plant at Watertown, N. Y., and since the first of the year has closed contracts for about 15,000 brakes for various railroad systems. Recent orders include air brakes for 4,500 cars for the Union Pacific Railroad; for 3,300 cars for the Pacific Fruit Express Co.; and for 1,000 cars for the Great Northern Railroad.

The Meadville Machinery Co. has re-opened the car shops of the Erie Railroad Co. at Stroudsburg, Pa., recently secured under lease, and will give employment to a normal working force on full time. The plant has been closed for more than a year. The company is also arranging for the immediate resumption of operations at the Huntington, Ind., shops of the same railroad, also acquired under lease. The entire plant, including round house and locomotive department, will be operated under contract work for the road. The Meadville company, will also operate the shops of the Erie system at Meadville, Pa., and at Cleveland and Galion, Ohio.

The Jordon Motor Car Co., Cleveland, Ohio, announces an increase in production of 350 per cent during February, as compared with the same month of last year. The plant is running at full capacity, with orders on hand to insure this rate of production well into July.

The Summerill Tubing Co., Bridgeport, Pa., manufacturer of steel pipes and tubing, is maintaining active production at its works and reports that orders received in January and February are in excess of those booked during the last four months of 1921.

The Youngstown Pressed Steel Co., Warren, Ohio, affiliated with the Sharon Steel Hoop Co., of Sharon, Ohio, will increase production in its metal lath manufacturing department, enlarging the works and installing additional machinery

The Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., has secured an order for railroad equipment for the National Railways of Mexico, totaling $100,000.

The Talbot Manufacturing Co., Easton, Md., manufacturer of wheelbarrows and kindred equipment, is working on a capacity schedule with orders on hand to maintain this basis of operation for several months to come.

The Reo Motor Car Co., Lansing, Mich., is maintaining a capacity schedule at its plant, with incoming orders in recent weeks considerably in excess of shipments. During January the company sold 1,000 more cars than the local plant shipped.

The Penn Seaboard Steel Corporation, Franklin Bank Building, Philadelphia, Pa., is operating at four of its five plants, and plans to resume production at the fifth unit at an early date.

During the first week in March, automobile and automobile equipment manufacturing plants at Jackson, Mich., increased their working forces by more than 300 men.

The Lima Locomotive Works, Lima, Ohio, has secured an order for five consolidation type locomotives from the Toledo, St. Louis & Western Railroad Co. A contract has also been secured from the Chicago, Burlington & Quincy Railroad Co., for eight locomotives of heavy mountain type.

The Standard Tank Car Co., Sharon, Pa., is increasing production at its plant, and has recently secured an order for sixty insulated tank cars for gasoline transportation.

The Brier Hill Steel Co., Youngstown, Ohio, has adopted a capacity schedule at its two plate mills.

The Baltimore & Ohio Railroad Co. has resumed operations at its car repair shops at Glenwood, Pa., following a shut down for a number of weeks.

The Baldwin Locomotive Works, Philadelphia, Pa., has secured a contract for forty-seven locomotives of Mikado, Pacific and Santa Fe type, from the Chicago, Burlington & Quincy Railroad Co., approximating $2,000,000.

The Colorado Fuel & Iron Co., Denver, Colo., has taken an order from the Santa Fe Railroad Co., for 10,000 tons of rails, and will handle the production at its Pueblo shops. The company is said to have secured a contract for about the same amount from the Northern Pacific Railroad Co.

The Fedders Manufacturing Co., Military Road, Buffalo, N. Y., manufacturer of automobile radiators and other metal products, is arranging for immediate increase in production, and for this purpose has leased the former plant of the Lautz-Missiquoi Marble Works in Bridgeburg, Ontario, for a branch factory. Machinery will be installed at once.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

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Sailors say that however smooth the course they are sailing, a gale is always blowing or brewing somewhere on the seven seas and in this generalization the merchant will probably agree with the mariner.

The ship of American business is holding steadily on her course. The breeze is moderate, and though her speed is not great it is quickening, but in the offing there are to be descried some political clouds that may soon make it wise to "go about" unless they are meantime dispelled. One of these clouds is the growing opposition to the Four Power Treaty in the Senate.

The divorcement of politics from business is tritely urged in the United States but it is becoming plain that politics, and especially international politics, is the nation's most important business just now; and if through the Senate action or inaction we shall add to our refusal to enter the League of Nations, a rejection of the treaty that Mr. Hughes has negotiated we may become something of an Ishmael among the nations.

In refusing to attend the Genoa Conference because political questions were to be discussed there, we have come very near to excluding ourselves from the world's international fellowship and it is to be hoped that we will not further emphasize our aloofness and egocentricity.

Exports Falling

These remarks are prompted by the statement of our foreign trade for January. For the seven months ending Jan. 31 the excess of merchandise exports over imports fell from over 4½ billions in 1920 and 1921, to about 2¼ billions in 1922, and it is at present running at the rate of not much over $700,000,000 annually. If the reduction in the so called favorable balance was due to an increase in imports, it might be said that we were collecting the debts due us in goods; but this is not the case, for imports during the seven months period declined in about the same proportion as exports and the fact seems to be that our foreign trade is simply drying up, largely because the spirit of non intercourse that dominates our political policy in international affairs is gradually atrophying our commercial relations.

In time we can of course prosper by trading between ourselves alone, but it is to be feared that in the process of adjusting the nation's business to this limitation we shall experience much discomfort. Meanwhile it is to be noted that the total of our intercontinental foreign trade for January—that is our exports and imports to and from Canada, Mexico and Central America—is nearly $84,000,000, which is about equal to the business we did with England in the same month. From this it is plain that our overseas commerce is rapidly dwindling.

This is about the only unfavorable factor that is to be discerned in the week's development and for the present, at least, it seems likely that its normally chilling effect will be offset by the continued gain in our gold supply and the resulting redundancy of credit. The Federal Reserve statement for the week shows an increase of $14,000,000 in the gold on hand and a rise of 1.1 per cent in the reserve ratio, which now stands at 77.8 per cent.

These figures bespeak an ease of money that facilitates the sale of all interest bearing obligations, and the result has been a demand for bonds that has advanced old issues and made it possible to bring out many new ones. Because they are so readily salable tax exempt securities are being put out with great freedom and some thoughtful bankers are concerned about the municipal extravagance thus induced.

Inflation is Here

But the extravagant expenditure of borrowed money is always a concomitant of inflation; it is in fact inflation, and there is no use mincing words. We are now entering upon a well defined period of inflation. Its advent has for some time been predicted in these letters and its arrival is attested by the reviving activity of nearly every speculative market. In grain and cotton its effect has already been partially felt but is not by any means exhausted.

The reaction of last week was but a resurgence of the rising tide that has lifted coffee about half a cent a pound and advanced sugar to 5.30 for granulated, the highest price touched in some months. Crude rubber, which is selling at 14½ cents a pound for "plantation latex" may be one of the next staples to show the tonic effect of our gold cure. Apparently there is a huge oversupply of rubber, but the price is almost the lowest on record, which is a combination that is almost sure to attract buying under present conditions.

Conditions not dissimilar exist in silk, which has become a highly speculative commodity. In the steel industry things are admittedly better and some quotations have been advanced quite sharply. Trade reports are distinctly optimistic, and a Birmingham correspondent writes us "Well, as you said we have turned the corner. Our furnaces and mines are opening up and by July 1 will be operating at 60 per cent capacity. The feeling is sure exhilarating to business men and laboring people." Copper after some hesitancy has again joined the advancing procession and "a broad demand at 13¾ cents" is reported. And so one might go through the whole list of basic commodities. The jobbing trade in finished products has not yet caught step, but it is sure to do so as spring opens and summer turns the leaves of nature's book.

The threatened strike of the bituminous coal miners and the labor troubles in which some of the New England cotton mills have become involved are not to be ignored, but in the cotton trade it is a maxim to "buy on strikes because they are always called to be settled" and there is, I think, still reason to hope that the coal strike will be averted.

The cheerfulness of the American business world is naturally reflected in the stock market and the reactionists, as the bears now call themselves, have found it difficult to hold prices in check. The advance in the securities of the little Ann Arbor Railroad, which have nearly doubled in value because the Pere Marquette is said to have bought it, is symptomatic of what may be expected as the opportunity for the railroad consolidations, for which the Esch-Cummins bill provides, is appreciated.

I know nothing of the facts in the Ann Arbor-Pere Marquette affair but it should be plain to every student of our railway problem that its easiest solution is to be found through consolidation, and that the railway managers who are not lacking in intelligence, despite their sometimes tactless strategy, will take "the easiest way."

The dispatches from overseas feature the troubles of Great Britain in India and the reported indisposition of Lloyd George, but the London stock market is nevertheless buoyant and there as here the influence of inflation is apparently an effort to exchange money for real property that is being made. There it is paper inflation. Here it is gold inflation. It remains to be seen which is the least objectionable or the most desirable. The way the question is put indicates the economic orthodoxy or heterodoxy of those who ask it. The bonus bill has not been mentioned because it is dead. Although the House will probably pass it, arrangements for its interment are being made in the Senate.

Chicago Metal Trades Association Gives Dinner

The twenty-fourth annual dinner and meeting of the Chicago branch of the National Metal Trades Association was held at the Mid-Day Club, Chicago, on Tuesday evening, March 7. A large number of members and guests were present.

The reports of the officers and the employment department showed all the activities to be in a healthy and satisfactory condition. One fact of particular interest that was brought out was that no strike or labor difficulty occurred in any of the plants during the past year.

Addresses were made by Myrick D. Harding, general superintendent, Chicago Plant, Armour & Company, and by Alvan T. Simonds, president, Simonds Manufacturing Co., Fitchburg, Mass.

The election of officers for the ensuing year resulted as follows: President, Harold C. Smith, Illinois Tool Works; vice-president, C. E. Finkl; treasurer, Wm. Ganschow; secretary, Paul Blatchford.

Chicago Letter

A complete canvass of the Western machine tool field shows that February was a much better month in the amount of business than January, although dealers give conflicting reports. The spotty condition of the market is shown by the fact that while most of the dealers found February better than January others report exactly the reverse.

Inquiries for machinery have increased steadily in number since the first of the year. The business trend since that time seems to be see-sawing (one week it is very good and the next week it is poor) and if the months show similar fluctuations, March will be a rather poor month although up to the present time everything seems to point to a month of good business.

The recent auction of equipment in the plant owned by H. C. Williamson, Chicago, has been declared a failure by many who were present at the sale. Although most of the machines were of late type and little used, only about half were removed.

The Santa Fe system has added the following to its outstanding list: One heavy-duty type crank shaper with 24-in. stroke, one 2-in. double-head bolt cutter, heavy-duty type and one heavy-duty type gap engine lathe to swing 18-in. over bed.

There was an increase of about 100 per cent in the number of building permits, issued during February compared with the same month last year. But even though the number of permits was greater, the total cost of the projects was almost 10 per cent less. There is a reported increase of 39 per cent in the amount of contracts let in the Central West. This is a rather optimistic outlook from the steel man's point of view.

Business Items

The Chandler Motor Car Co., of Cleveland, Ohio, reports net earnings for the year 1921 totaled $41,017, or 14 cents a share on common stock, compared with $4,213,111, or $15.04 a share, in 1920.

Bethlehem Steel Corporation, Lackawanna Steel Co. and the Midvale Steel and Ordnance Co. have announced increase in prices of bars, shapes and plates to meet the $1.50 per 100 pounds quotation by the Jones & Laughlin Steel Co.

Directors of the Pennsylvania Railroad Co. ordered the purchase of 250 new steel cars for passenger service.

The Waterbury Clock Co., Waterbury, Conn., has purchased the property and assets of Robert H. Ingersoll & Brothers for $1,500,000 in cash. The sale is subject to the approval of the court.

The name of the Ball Engine Co., has been changed to the Erie Steam Shovel Co., with the same retinue of officers as before. The offices of the company will be located in Erie and in Pittsburgh.

The Whitman Barnes Co., Akron, Ohio, manufacturers of machine tools and drills, reports a decrease of 20 per cent in sales last year as compared to the year before, and a total operating loss for the year of $280,545. Net sales for the year were $620,052, while general administration expenses were $852,939.

The stockholders of the Garvin Machine Co. met in the plant in New York City on March 8 and the following officers were re-elected: Burr K. Garvin, president; Warren Garvin, vice-president; George Maclagan, treasurer; H. R. Garvin, secretary. Rodger B. Garvin continues as general manager.

Plans for the organization of the Zeder Motor Company, at Cleveland, Ohio, were being made this week under the direction of R. T. Hodgkins, president. The company has been founded by F. M. Zeder, for several years chief engineer of the Studebaker Corporation. The company expects to produce a six-cylinder car, to be made in the plant of the Cleveland Tractor Company.

Reports received in machinery and allied circles this week indicate to Cleveland financial interests that Henry Ford may buy the Tuscora Rubber Co. plant at New Philadelphia, Ohio. It was stated that Ford personally has recently looked over the plant.

The Massachusetts Gear and Tool Co., of Woburn, Mass., has been incorporated under the laws of Massachusetts and has purchased the business and equipment of the Woburn Gear Works of that place. The business of specializing in small and medium size gears and sprockets will be continued.

The Gray Hub Co. has been organized in Detroit, Mich. to manufacture a line of automobile and truck hubs. The company was organized by R. B. Gray who for the past twelve years has been associated with the Timken-Detroit Axle Co., as factory manager. A plant has been secured at 642 Catherine St., Detroit, and production is on the way.

The Monarch Tool Co., of Sidney, Ohio, announces a reduction of 10 per cent on Monarch lathes.

The Sebastian Lathe Co., has been chartered with an authorized capital of $100,000 to manufacture and sell lathes and other special machinery in Cincinnati, Ohio. Among the incorporators are E. E. Stokes and Clare E. Sebastian.

At a recent meeting of stockholders of the Davenport Machine Tool Co., Rochester, N. Y., the following directors were elected: W. S. Davenport, A. T. Hatch and C. W. McKay, of Rochester; G. E. Merryweather, of Cleveland, Ohio, and C. R. Burt, of Syracuse, N. Y.

The American Brass Company, Waterbury and Ansonia, Conn., recently announced a reduction of a quarter of a cent per pound for all finished products, which brings current quotations on sheet stock down to 20¼ cents per pound. This is the second reduction made during the past two weeks. The present price allows a limit of 7¼ cents per pound for manufacturing costs and profits in the conversion of copper into brass.

The York (Pa.) plant of the American Foundry Equipment Co., is being moved from the old location on North St., to larger and better adapted quarters on East Market St., adjacent to the Maryland & Pennsylvania Railroad. The company's molding machines, flasks, jackets, and pattern mounting sundries are manufactured at this plant. Sand cutting machines, sand blast equipment, dust arresters and core machines will continue to be manufactured at the main plant, 2935 West 47th St., Chicago.

The Wright & Querie Manufacturing Co., 909 North Colony St., Meriden, Conn., recently incorporated under the laws of Connecticut to manufacture machine and wood screws, hardware, etc., was organized last week by the election of the following officers: President, H. H. Wright; secretary and treasurer, C. W. Wright; vice-president and assistant treasurer, O. J. Querie. The directors are the above mentioned and R. W. Berry and A. H. Smith.

The Steel-Flex Coupling Corporation has been organized and has opened general offices in the First National Bank Bldg., Detroit, Mich. The company will market a line of power transmission equipment. Officers recently elected are: Norman Pearson, Detroit, president; Sidney R. Teasdale, Cincinnati, vice-president; Frederick O. Breed, Buffalo, secretary.

The Allen-Hogan Corporation, Stamford, Conn., has filed a certificate of incorporation under the laws of Connecticut, to engage in the manufacture of metal spool ends and flanges for piano player rolls, and to do other general manufacturing; capital stock is $50,000, and the incorporators are R. E. Gillmor, Van Renssellaer Ave., Stamford; A. E. Moore and J. L. Watson, both of New York City.

The W. F. Concannon Shear Co., 42 Depot St., Milford, Conn., recently incorporated to manufacture steel shears and scissors, have announced through general manager and president William F. Concannon, that the concern will shortly remove to Bridgeport, Conn., where a factory will be established.

The Driscoll Transmission Corporation, which for the past three years has been developing its variable speed transmission in its Astoria plant, is moving to larger and more accessible quarters in New York City, where it will build and install a number of models of the device on various types of machines for which its use has been licensed. The New York laboratory and shop of the corporation is now at 416-22 West 33rd St.

H. B. Smith Co., Westfield, Mass., has begun the erection of an additional building for its foundry work. It will be of steel frame construction.

A 22 per cent reduction of wages at the Savage Arms Corporation's plant in Chicopee Falls, Mass., became effective on March 4.

Page-Lewis Arms Co., Chicopee Falls, Mass., is about to place on the market a new 22-cal. bolt-action, single-shot sporting rifle, and expects to bring production to 150 a day shortly. This weapon is designed to meet the low-price importations from Germany. The 22-cal. lever-action rifle, which sells at a higher price, has been out since Dec. 1, the rate of output being 150 daily. These rifles are being sold chiefly in the Western states, where sufficient orders have been taken to keep the factory busy until May.

Directors of the Archer Automatic Riveting Machine Co., Inc., of Oroville, Cal., have requested the Superior Court in that place to order a dissolution of the corporation. The company was organized in 1912.

A wage reduction averaging 15 per cent for 600 plant employees became effective on March 6 at the motorcycle and bicycle works of the Hendee Manufacturing Co., Springfield, Mass.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Drills, Twist, "Mezzo-Steel"

Cleveland Twist Drill Co., Cleveland, Ohio.

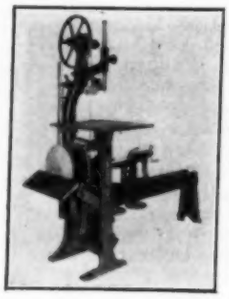
"American Machinist," November 3, 1921.

The steel and heat-treatment used are said to make it possible to obtain a performance much better than that of carbon steel, in fact, midway between carbon and high-speed steel. The drills are particularly well adapted for drilling cast iron and soft steel at greater speeds and feeds than can be used for carbon drills. Heating the cutting edge of a Mezzo drill to even a dark blue color does not draw its temper, but the tool works at its best efficiency at this temperature. The drills have a blue-black, rust-resisting finish. They can be furnished between $\frac{3}{16}$ and 2 in. in size.

Sawing Machine, Band, Three-Way-Table

Paddock Tool Co., 320 Ridge Bldg., Kansas City, Mo.

"American Machinist," November 3, 1921.



The principal features of this machine for wood-working use are that the table can be tilted in any one of three directions, and that a three-wheel ball bearing guide is employed for the saw. The 20-in. machine will take a cut under the saw guide 16½ in. deep. The band wheels run on double-row ball bearings. The motor is mounted on the base of the frame. The machine can be furnished with attachments as shown. They include a 15-in. sanding disk having a tilting table. On the back of the frame is an 18-in. wood-turning lathe having cone pulleys. A 35 x 6-in. sanding roll can be placed in the lathe. The machine is made in four sizes, the band-wheels being 20, 25, 30 and 36 in. in diameter, respectively.

Tractor, Caterpillar, T-35

Holt Manufacturing Co., Inc., Stockton, Cal.

"American Machinist," November 3, 1921.

The machine is intended for general use. It consists of three main units, the motor, the transmission, and the trucks and tracks, each unit being entirely self-contained. A four-cylinder motor is used, the bore being 4 in. and the stroke 5 ½ in. The transmission provides three speeds forward and one reverse. Side clutches are provided, so that either one of the trucks can be disengaged from the motor, to turn the machine. The tractor is 103 in. in length overall, 48 in. wide, and 52 in. in height to the top of the hood.

Reamer, Cylinder, Expansion, Ransome

H. A. Hopkins & Co., Inc., 247 LaPorte Ave., South Bend, Ind.

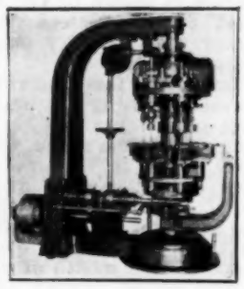
"American Machinist," November 3, 1921.

The reamer can be used without removing the cylinder blocks from the chassis, and is ordinarily driven by hand. A ratchet wrench can be furnished to fit on the shank. The reamer consists of three units, the body, the nut and the blades. A micrometer dial is provided so that it is possible to set the blades with an accuracy of 0.001 in. Ordinarily, the lower ends of the blades are ground without clearance slightly smaller than the cutting edges, so that they serve as a pilot to assist in the entering of the reamer. The tool is made in five sizes, the total range being from 2¾ to 4 in.

Chucking Machine, Automatic, Vertical, "Jackson"

Vertomatic Manufacturing Co., Third and Buttonwood Sts., Reading, Pa.

"American Machinist," November 3, 1921.

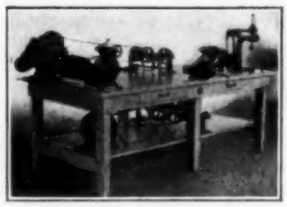


The machine is intended for rapid and automatic machining on small parts such as required for plumbing, electrical and automobile work. Drilling, tapping, facing and similar operations can be performed on the same piece, the operator merely feeding the machine. The type-A machine is intended chiefly for work requiring from three to five operations on the same piece. There are six work-holding chucks and five active spindles. The type-B machine is for work requiring two or three operations. It has four double chucks and three pairs of spindles. The type-C machine is for jobs requiring a single operation only, or two operations combined in one tool.

Bench, Work, Combination, No. 2

Myers Machine Tool Corporation, Columbia, Pa.

"American Machinist," November 3, 1921.

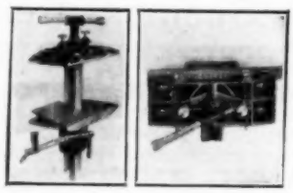


The outfit is intended for use in such places as automobile repair shops and hotels, and for mechanics who have need for a small installation. The machines are mounted on a table 45 in. wide x 84 in. long and 32 in. high. Two drawers are provided for holding small tools. On the shelf of the table is mounted a motor that drives all of the apparatus through a countershaft. The following equipment is furnished: A lathe having a swing of 10 in. and a working length of 45 in.; a 10-in. sensitive bench drill, having a small table and a ½-in. chuck; a 10-in. grinder head carrying an abrasive wheel and a muslin polishing wheel; and a 3½-in. machinists' vise.

Vise, Woodworkers', Universal No. 1

Oliver Machinery Co., Grand Rapids, Mich.

"American Machinist," November 3, 1921.

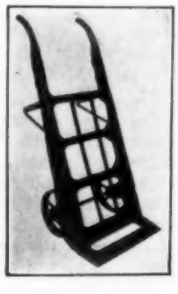


The vise is capable of operation in many different positions, and is adaptable to a wide range of work. On the right of the accompanying illustration it is shown in its natural position. The jaws can be set by means of thumbscrews so as to clamp at an angle. They can be turned about the axis of the screw, and used to hold work in any position. When swung through one-half turn, the small steel-faced jaws come in position for the holding of metal parts. The jaws can also be placed in a horizontal plane, as shown on the left. The small detachable angle jaw lying on the lower jaw is for use in holding irregular-shaped pieces. The jaws are 18 in. long by 7 ¼ in. wide, and the vise has an opening of 16 in. Net weight, 85 lb.

Truck, Hand, "Bluenose"

Sharon Pressed Steel Co., Sharon, Pa.

"American Machinist," November 3, 1921.



The principal feature of this truck is the fact that it is constructed entirely of pressed-steel parts, with the exception of the wheels, axle and handles. The main frame is made in one piece of ¼-in. steel. The crossbars are made straight for general use, but can be depressed for the carrying of barrels. The nose of the truck is a steel stamping made from one piece of ¼-in. steel. The trucks are equipped with malleable-iron wheels, and either plain or roller bearings. They are made in two sizes the lengths overall being, respectively, 54 and 64½ in.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

CHARLES F. SMITH, president of Landers, Frary & Clark, of New Britain, Conn., has resigned as chairman of the board of directors of the New Britain Machine Co.

EDGAR T. GLASS has resigned as superintendent of the tractor department of the New Britain Machine Co., New Britain, Conn.

HAROLD BLYE, formerly general superintendent of the National Brass Co., Grand Rapids, Mich., and more recently consulting engineer for the Benj. Buckley Co., Paterson, N. J., is now shop manager of the H. E. Boucher Manufacturing Co., experimental devices and marine models, New York City.

E. M. GRIFFITHS, founder of Burton-Griffiths & Co., Ltd., of London, England, has resigned his position as managing director and chairman of that concern and has also retired from the board of the Birmingham Small Arms Co., Ltd., so that he is no longer associated with the control of either company. His city address is now 30 Ludgate Hill, London, E. C.

F. T. SMITH has been elected president of the Republic Motor Truck Co., of Alma, Mich. He succeeds J. N. Willys.

STUART D. LANSING, president of the Bagley & Sewell Co., paper making machinery manufacturers, of Watertown, N. Y., has returned after spending several months in Europe and Asia. Mr. Lansing made a study of market conditions and reports little activity in foreign fields.

ALBERT TURNER, for twenty years engineer with the Norton Company, Worcester, Mass., has joined the engineering staff of the Heald Machine Co.

HORACE S. PECK, formerly comptroller, S-K-F Industries, Inc., New York, is temporarily without an executive business connection on account of changes in the business policy of S-K-F Industries, which caused the resignation of several of the officers and directors of that organization. Mr. Peck is retaining his membership in the Industrial Cost Association, with executive offices at 50 Church St., New York City, and will continue to serve that association as president.

E. R. LYMAN, formerly connected with the management of the Crofoot Gear Works, Boston, Mass., has been elected president and treasurer of the Massachusetts Gear and Tool Co., Woburn, Mass.

JOSEPH CAVICCHI, former works engineer of the Crofoot Gear Works, Boston, since its incorporation, has been appointed superintendent of the Massachusetts Gear and Tool Co., Woburn, Mass.

C. F. TOLLZIEN, factory manager of the Packard Motor Car Co.'s plant in this city, has resigned and will engage in private business. He has been succeeded by Mr. Gill, who has been production manager of the plant for some time.

JAMES BARR, formerly with the Vandyck-Churchill Company, of New York, is now Eastern representative for the American Tool Works, of Cincinnati, Ohio.

C. E. MOORE has been elected vice-president and secretary of the Herbert Machinery and Supply Co., Los Angeles, Cal.

GUY P. MILLER, treasurer of the American Tube and Stamping Co., Bridgeport, Conn., and former treasurer and general manager of the Bridgeport Brass Company, has recently become associated with the firm of Searle, Nicholson, Okey & Lill, auditors, accountants and engineers. The firm has offices in New York City and branches in several of the large cities throughout the country. Mr. Miller, will still remain in Bridgeport, but will be ready for call from the firm on special municipal taxation problems, upon which he is an expert.

H. L. WILSON, formerly vice-president of the Columbia Graphophone Manufacturing Co., New York and Bridgeport, Conn., has been elected president of the company, succeeding Van Horn Ely.

NEIL W. EYER, sales representative in Dayton, Ohio, for the Betz-Pierce Co., Cleveland, jobber of iron and steel, has been appointed district sales manager for the company in southern Ohio. Mr. Eyer is the oldest representative in point of service in the company's sales department. Frank E. Gaines has been made sales representative with headquarters in Indianapolis, Ind.

JOSEPH H. ROBERTS has resigned as superintendent of the bar steel and special products division of the Nicetown works of the Midvale Steel and Ordnance Co., of Johnstown, Pa. He will become assistant to president L. J. Campbell, of the Electric Alloy Steel Co., Youngstown, Ohio.

W. H. SMITH, of Toronto, has been appointed chief engineer and designer for the Wood-Gorrie Motors Co., Ltd., of St. Thomas, Ont. A. J. Gorrie of Montreal, formerly general superintendent of the Canadian Northern Railway for Quebec, is vice-president.

J. P. CARRITTE of the General Aluminum and Brass Co., Detroit, Mich., has been appointed president and general manager of the Canadian Aluminum and Brass Co., Ltd., recently formed at Windsor, Ont., for the manufacture of castings for automobiles.

Obituary

EDGAR H. COTTRELL, president of C. B. Cottrell & Co., printing press manufacturer, of New York, died at his home in that city on March 7. He was 72 years old.

WILLIAM G. SKINNER, chairman of the board of directors of the Colt Patent Fire Arms Co., Hartford, Conn., died on March 8. He was 67 years old.

SENATOR JOHN MILNE, head of the Burrow, Stewart & Milne Foundry, and one of the outstanding figures in the manufacture of various metal products, died on March 4 at his home in Hamilton, Ontario, Canada.

JAMES E. GREENSMITH, president of the Boston Scale and Machine Co., Boston, Mass., died on March 8. Mr. Greensmith was a mechanical engineer and was connected with various machine tool concerns during his career. He was a member of the American Society of Mechanical Engineers and of the Engineers Club of Boston.

JOSEPH H. SHEPHERD, formerly with the Blanchard Machine Co. of Cambridge, Mass., as mechanical engineer, died on March 2 at his home in Needham Highlands, Mass.

COL. JOHN LAMBERT, first president of the American Steel and Wire Co., died on March 6 at Pasadena, Cal., where he made his winter home. He was 75 years old. Col. Lambert was associated with John W. Gates and Elbert H. Gary in the organization of the United States Steel Corporation.

OTIS H. CUTLER, chairman of the board of the American Brake Shoe and Foundry Co., died suddenly while cruising in Southern waters. His home was in Suffern, N. Y. He was an official in several corporations and a director of the Baldwin Locomotive Works.

Forthcoming Meetings

Taylor Society: Mid-winter meeting, Philadelphia City Club, Philadelphia, Pa., March 16, 17 and 18. Secretary's headquarters, 29 West 39th St., New York City.

National Metal Trades Association: Annual convention April 17 to 20, Hotel Astor, New York City. H. W. Fisher, 1022 Peoples Gas Building, Chicago, Ill., secretary.

American Gear Manufacturers' Association: Sixth annual meeting, Buffalo, N. Y., April 20 to 22. Secretary, F. D. Hamlin, 4401 Germantown Ave., Philadelphia, Pa.

Southern Supply and Machinery Dealers Association: Annual meeting, Birmingham, Ala., April 24 to 26. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, A. M. Smith, c/o Smith-Courtney Co., Richmond, Va.

National Machine Tool Builders' Association: Spring convention, Hotel Traymore, Atlantic City, N. J., April 25 and 26. Ernest F. DuBrul, 817 Provident Bank Bldg., Cincinnati, Ohio, general manager.

National Research Council: Annual meeting of executive board, April 26, Washington, D. C. A. D. Flinn, 29 West 39th St., New York City, chairman.

Society of Industrial Engineers: Annual meeting April 26, 27 and 28, Detroit, Mich. G. C. Dent, 327 La Salle St., Chicago, Ill., business manager.

American Society of Mechanical Engineers: Spring meeting, Atlanta, Ga., May 8 to 12. Secretary Calvin W. Rice, 29 West 39th St., New York City.

National Supply and Machinery Dealers Association: Annual Convention, Atlantic City, May 8 to 10. (In conjunction with American Supply and Machinery Manufacturers Association.) Secretary, Thomas A. Fernley, 505 Arch St., Philadelphia, Pa.

Foreign Trade Council: Annual Convention, Philadelphia, Pa., May 10 to 12. Secretary, O. K. Davis, 1 Hanover Square, New York City.

United States Chamber of Commerce: Annual meeting, Washington, D. C., May 16 to 18. Secretary, D. A. Skinner, Riggs Bldg., Washington, D. C.

National Association of Office Managers: Annual meeting, Washington, D. C., May 18 to 20. Secretary, F. L. Rowland.

American Society for Steel Treating: Pittsburgh Section meeting, Bureau of Mines Auditorium, Pittsburgh, Pa., May 25 and 26.

American Foundrymen's Association: Annual meeting, Rochester, N. Y., week of June 5. Secretary, C. E. Hoyt, 140 South Dearborn St., Chicago, Ill.

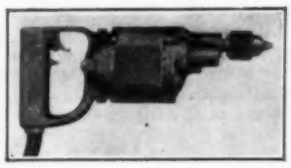
American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

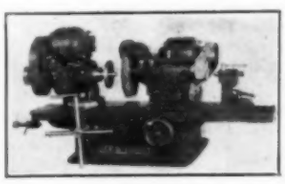
Patented Aug. 20, 1918

Drill, Electric, Portable, Light, ¼-inch
Black & Decker Manufacturing Co., Baltimore, Md.
"American Machinist," November 3, 1921.



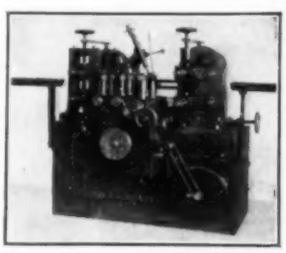
The drill has an aluminum-alloy housing, and weighs only 5 lb. It has double reduction gearing, giving a no-load speed of 1,600 r.p.m. It has stub-tooth gears of heat-treated chrome-nickel steel, running in a grease-tight box. All bearings are removable and renewable. The drill is equipped with a pistol grip and trigger switch, with the switch mechanism in the handle. The spindle is arranged so that it is possible to drill within about an inch of a corner. The parts are accessible. The tool is supplied complete with a three-jaw chuck, flexible cord and attachment plug.

Grinding Machine, Piston and Valve, Bench
Van Norman Machine Tool Co., Springfield, Mass.
"American Machinist," November 10, 1921.



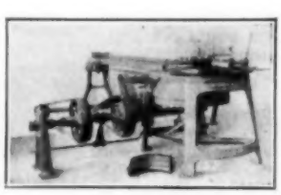
The machine combines many of the functions of the lathe with those of both the internal and external grinding machine. It is intended for turning, regrooving, and grinding pistons, refinishing valves and wristpins and for similar work on many small automobile parts. The work spindle and the grinding wheel spindle are driven by independent motors of ⅛ and ¼ hp., respectively. The work table slides upon ways and has a traverse of 14 in. The wheelslide is gibbed to the base. The wheel spindle runs on ball bearings at a speed of 2,800 r.p.m., and is driven by a motor mounted on the same slide. The machine will swing work 8 in. in diameter and take 12 in. between centers. It occupies a bench space of 3 x 4 ft. and weighs 330 lbs.

Welding Machine, Steel-Tube
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



The machine is made in two sizes, the No. 2 machine here illustrated having a capacity from 1¼ to 4 in. in diameter on 10-gage steel. In order to vary the speed of the tubing through the machine, a d.c. adjustable-speed-motor giving welding speeds from 24 to 168 in. per minute is provided. The bearings that are subjected to heat are water cooled. An oxy-acetylene torch is carried on an adjustable arm, and the welding is done continuously as the tubing passes through the machine. Acetylene generators can be furnished in order to supply gas for the torches.

Bending Machine, Tubing, Power-driven
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.

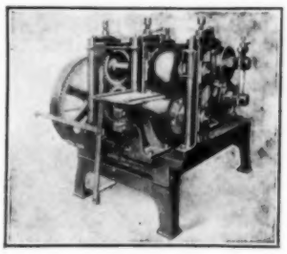


The machine is made in three sizes. It is ordinarily equipped with double clutch pulleys, to provide for operation in either direction. Back benches and power attachments can be furnished, as shown. It is said that the construction of the bending mechanism makes possible the bending of thin-wall tubing without wrinkling or distortion. A special swing frame cut-off saw running at high-speed can be furnished for cutting the tubing to length either before or after bending.

Scleroscope, Model-C, Changes in
Shore Instrument and Manufacturing Co., Jamaica, N. Y.
"American Machinist," November 3, 1921.

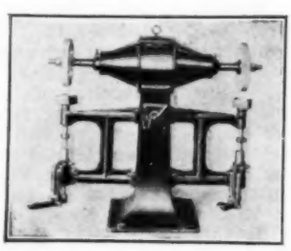
In this Model C-1 scleroscope the maker claims that the refinements made increase the flexibility of the operating mechanism. A fine screen covers the openings in the housing above the scale, to prevent dust from entering the operating mechanism. The leather operating piston has been replaced by one made of tungsten steel. The hammer-hook mechanism has a flexible adjustment. The instrument is adaptable to the use of the labratory man, as well as to the precision manufacturer on quality production.

Forming Machine, Steel-Tube.
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



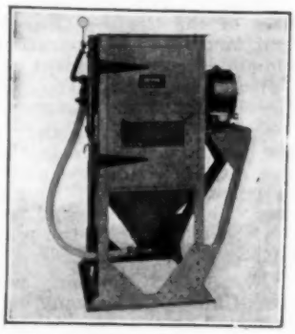
Strips of steel are run through this machine in order to shape them into tubes. The No. 2 tube-forming machine shown has a capacity from 1½ to 3 in. in diameter and handles steel up to 14-gage. The machine is also made in Nos. 0, 1, 1½ and 3 sizes. A hollow conical conductor between the roll stands completes the forming started by the first pair of rolls, and the second pair compresses the tube into a circular shape. Three-roll stands can be furnished for use on large tubing. The machine can operate continously, and requires but one attendant.

Grinding Machine, Steel-Tube, Motor-Driven
Davis-Bournonville Co., Jersey City, N. J.
"American Machinist," November 10, 1921.



The machine is intended for grinding off the ridge made on the outside of steel tubing by welding. It consists of a 7½-hp. a.c. motor, provided with a starting device and carrying two grinding wheels. The foot control is so attached to the tube guide as to vary the pressure of the tubing against the wheel, and also to permit of swinging the work to any angle. The tubing is passed through at a slight angle, and the "flash or bead" is removed by the wheel, which becomes concave.

Sand-Blasting Machine, Barrel-type
Pangborn Corporation, Hagerstown, Md.
"American Machinist," November 10, 1921.



The machine is of the barrel type, and is especially intended for use in small industrial plants where the parts to be cleaned are not large and where only comparatively small capacity is required. It consists of a sheet-metal, dust-tight cabinet on a structural-steel frame. The bottom is a hopper to receive the abrasive. The barrel or drum mounted within this cabinet is 24 in. in diameter by 16 in. long and is power driven. The work in the barrel rotates slowly, all pieces and faces passing under the blast action.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Ark., Springtown—C. P. Ogdon—oil filtering plant.

Cal., Santa Cruz—F. McMillan—automatic wood-turning lathes and woodworking tools.

Conn., Greenwich—E. A. Wood, Stanwich Rd.—one No. 4 Burke milling machine.

Fla., Chuluota—D. G. Zeigler—brick machines, concrete block machines, tile machines, concrete mixers and other machinery and equipment for brick and concrete manufacturing. Wants to correspond with parties who can contract to build special machines from drawings.

Fla., Inverness—The Inverness Coca-Cola Bottling Co., W. T. Baxley, Mgr.—shafting and bottling machinery for new factory.

Fla., Pensacola—The Figland Park Canning Co., c/o W. Honsberger, Secy., Route A, Box 219—complete installation of machinery for proposed canning plant.

Fla., Sumica—The Florinda Mill & Planing Mill, W. J. Frank, Mgr.—one 6 x 15 fast feed planer and matcher; blow pipe system complete for planing mill; one covel circular saw grinder for 60 in. saws; Moore dry kiln.

Ill., Chicago—Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., M. J. Walker, Purch. Agt—one heavy duty type crank shaper 24 in. stroke; one heavy duty type 2 in. double head bolt cutter and one heavy duty type gap engine lathe to swing 18 in. over bed.

Ill., Chicago—E. M. Heller & Co., 144 West Kinzie St.—one 3,000 to 4,000 lb. Detroit or standard make electric hoist with 220 single phase, 60 cycle alternating current motor.

Ill., Chicago—The Purch. Dept. of the International Harvester Co., 606 South Michigan Blvd.—one 43 in. to 45 in. round listing magnet.

Ill., Chicago—B. H. Wilson, 409 Transportation Bldg.—
One set sand sieves 20 and 30 mesh standard 8 in. dia., brass rims also other mesh sieves up to and including 80 mesh.
One set cement sieves 100 and 200 mesh, standard 8 in. brass rims with lid and bottom.
One set stone sieves single and gang molds A. S. C. E. Briquette.
One 1,000 lb. and one 2,000 lb. Olsen shot cement testing machine.
One vicat needle.
One Olsen permeability testing apparatus.
One steaming apparatus, 15 x 15 x 30 in.
One Olsen drying oven.
One set Olsen pans plate No. 47.
One Olsen graduate plate No. 48.
One Olsen scale plate No. 51.
One temperature apparatus plate No. 52.
One hand temper plate No. 53.
Six 8 in. mason trowels.
Two Physical testing machines, Olsen or Richle.

Ill., Cicero—The Dearborn Truck Co., 1301 South Cicero Ave.—one air compressor direct motor or belt drive, capacity not less than 140 cu.ft.

Ill., Granite City—H. C. Quin, 2425 C St.—smoke stacks, belts, shafting and motor.

Ill., Quincy—The Illinois Mfg. & Supply Co., 222 Commercial Alley, C. N. Terwische, Pres.—bending roll capacity 1 in. steel plate, 8 ft. wide.
Punch and shear, 36 in. throat, capacity 1¼ in. through 1 in. and suitable for shearing 1 in. steel plate.
One 20 in. drill press.
Steam hammer.
One 30 in. or 36 in. band saw.
One wood lathe.
One 24 in. iron lathe.

Ill., Rock Island—D. Donaldson Co., 1716 25th St.—repair machinery including chain hoist.

Ill., St. Anne—Builders Specialty Mfg. Co.—cupola 2 ton capacity blower with flasks.

Kan., Oswego—H. Romine, garage—drill press, lathe, shafting and belting.

Mass., Worcester—The Wickwire Spencer Steel Corp., 69 Hammond St.—"Medart" straightening machine, for straightening ¼ in. steel wire in 18 ft. lengths.

Md., Baltimore—The Aromo Mfg. Co., 308 South Hanover St., A. W. Smith, Mgr.—bottling machinery and chemical apparatus, including mixers, sifters, etc.

Md., Baltimore—The Enterprise Building Co., 2532 Hollins St., J. H. Dewitz, Pres. and Mgr.—mill working machinery including saws, jointers, tenoners, sanders, etc.

Mich., Cadillac—The Cadillac Lumber & Chemical Co., W. L. Saunders, Purch. Agt.—special machinery to manufacture wood alcohol and acetate of lime.

Mich., Detroit—The Cartwright Die & Tool Co., 2962 Hart Ave.—die making equipment.

Mich., Detroit—The Superior Pattern Wks., 1334 Maple St.—one B. & S. mill No. 2; one Van Norman No. 2 and one shaper (used).

Mich., Iron Mountain—The Iron Mountain Publishing Co.—paper cutting machine.

Mich., Port Huron—The Peg Tire Co., 319 Water St.—equipment for automobile and tire repair shop including moulds and vulcanizing equipment.

Mo., Joplin—The Apex Phonograph Co., 1904 South 4th St.—wood turning lathe also a dozen hand screw clamps.

Mo., Joplin—The Barnett Printing Co., 1607 Main St., W. F. Barnett, Purch. Agt.—power printing press for job work.

Mo., Joplin—E. Beasley, 313 West 4th St.—lathe, shafting, belting and small tools for garage.

Mo., Joplin—The Davis Auto Repair Co., 1821 Main St., D. Davis, Purch. Agt.—lathe and drill press.

Mo., Joplin—Helling & Herrod, Division St. and Bway., R. Helling, Purch. Agt.—drill press, drills, lathe, shafting and belts and small hand automobile tools.

Mo., Joplin—The Joplin Typographical Union, c/o J. Murray, Secy.—printing press for news paper and one for job work also metal sawing machine.

Mo., Joplin—A. B. McConnell, 115 East 4th St.—drilling tools and rig.

Mo., Joplin—G. Seward, 918 Bway.—drill press and lathe.

Mo., Joplin—The Western Mfg. Co., 1705 Main St., W. G. Proctor, Purch. Agt.—woodworking machinery, belt, shafting, wood saw and motors.

Mo., St. Louis—Thomsen Planing Mill Co., 1700 South Vandeventer Ave., J. Thomsen, Purch. Agt.—woodworking machinery, 3 drum sander.

N. J., Beverly—J. A. Bidwell & Co., Inc., 413 R.R. Ave., J. A. Bidwell, Purch. Agt.—looms, shafting, pulleys, etc., for new factory.

N. J., Trenton—Peters Auto Co., Commonwealth Bldg., has purchased factory at Bethlehem, Pa.—and plans to install machine tools and machinery for the manufacture of touring cars. W. P. Cubberley, 111 East State St., Trenton, Vice. Pres.

N. J., Trenton—The Star Porcelain Co., Muirheid Ave.—machinery for new addition to plant.

N. Y., Adams Center—S. Dibble Co.—power hack saw, and swing cut off saw for woodworking.

N. Y., Baldwinsville—The Morris Machine Co.—scroll saw, band saw for pattern maker and electric sander.

N. Y., Binghamton—The Pennsylvania Ave. Garage, H. D. Williams, Purch. Agt.—one 18 in. engine lathe and electric hand drill.

N. Y., Brooklyn—The Elgin Knitting Mills, 73 Roebling St.—"Brinton" cylinders 24 or 36 gage, 16 in., 12 to 14 cut.

N. Y., Buffalo—The Aldrich Mfg. Co., 55 Illinois St.—lathe with 20 in. swing or more and full equipment, also plating barrel, complete, with or without plating tank and revolving barrel.

N. Y., Buffalo—The Clifton Connor Corp., 895 Niagara St.—acetylene welding outfit.

N. Y., Buffalo—The Meyer Wagon Wks., 216 Elm St.—woodworking machinery.

N. Y., Canandaigua—The Miller Corset Co., E. H. Miller, Purch. Agt.—special machinery for the manufacture of corsets.

N. Y., Clinton—The Franklin Lithia Springs Inc., O. G. Burns, Purch. Agt.—machinery and equipment for bottling.

N. Y., Dunkirk—G. H. Graf—machinery for the manufacture of furniture.

N. Y., Jamestown—The Lake City Ice Cream Co., F. E. Bufton, Purch. Agt.—ice cream making machinery.

N. Y., Mannsville—J. Muller, J. McKone, Purch. Agt.—milk and ice handling machinery and equipment for milk station.

N. Y., New York—The Otis Elevator Co., 11th Ave. and 26th St.—one 14 in., one 24 in. and two 18 in. geared head engine lathes; two 3 in. spindle high speed drill presses; two double end dry grinders and one cold cut-off saw for Cleveland and Detroit plants.

N. Y., New York—A. Stroud, 327 Bway.—boring mill, 52 and 60 in., and Gorton universal graver for tire molds, (new or used). Prices boxed for export f.o.b. N. Y.

N. Y., Redwood—The Alexandria Dairymens League Co-Operative Assn., G. Hartman, Purch. Agt.—milk handling-pasteurizing machinery, refrigerating system, steam boiler and transmission equipment.

N. Y., Rochester—G. H. Higgins, 38 South Fitzhugh St.—rip saw with tilting table, about 36 x 44 in.

The Weekly Price Guide

THIS WEEK'S MARKET

NOMINAL quotation of $1.50 for structural shapes, plates and bars by certain independent Pittsburgh mills has made it increasingly difficult to purchase at the recent price of $1.35@$1.40. The minimum on large tonnages is practically confined to $1.40 per 100 lb. Soft steel bars are quoted in Chicago at $2.28 as against $2.53; bands at $2.88 reduced from $3.13 and tank plates at $2.38 as compared with $2.63 per 100 lb. one week ago. Slight advance in pig iron prices.

New York warehouses quote copper sheets at 20¼@21c. as against 20¼c. per lb. Recent improvement in copper, thought temporary at first, now shown to be permanent. Lead and spelter markets show improvement with no changes in price. Slight drop in cotton waste quotations in Chicago. Increased discounts on rubber and duck belting in New York warehouses. Linseed oil prices firm throughout the country.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$20.50
Northern Basic	21.02
Southern Ohio No. 2	22.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	26.26
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	22.00
Virginia No. 2	27.75
Basic	19.84
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern, sil 2.25@2.75	22.67
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	21.96
Basic	19.96
Bessemer	21.46

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25	3.28	3.10	3.38
No. 12	2.30	3.33	3.15	3.43
No. 14	2.35	3.38	3.20	3.48
No. 16	2.55	3.48	3.30	3.58
Black				
Nos. 17 and 21.	2.85	3.80	3.55	3.95
Nos. 22 and 24.	2.90	3.85	3.60	4.00
Nos. 25 and 26.	2.95	3.90	3.65	4.05
No. 28	3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11.	3.00	3.75@3.90	3.75	4.15
Nos. 12 and 14.	3.10	3.85@4.00	3.85	4.25
Nos. 17 and 21.	3.40	4.15@4.30	4.15	4.55
Nos. 22 and 24.	3.55	4.30@4.45	4.30	4.70
No. 26	3.70	4.45@4.60	4.55	4.85
No. 28	4.00	4.75@4.90	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	71	58½	⅜ to 1½	44½	29½
		LAP WELD			
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	69	57½	⅜ to 1½	44½	30½
2 to 3	70	58½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.00	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	7.00	8.00	6.03
Hoop steel	3.38	2.96	3.13
Cold rolled strip steel	6.25	8.25	6.50
Floor plates	4.60	4.56	3.40
Cold finished shafting or screw	3.35	3.25	3.40
Cold finished flats, squares	3.85	3.75	3.90
Structural shapes (base)	2.63	2.46	2.63
Soft steel bars (base)	2.53	2.36	2.28
Soft steel bar shapes (base)	2.53	2.36	2.28
Soft steel bands (base)	3.13	....	2.88
Tank plates (base)	2.63	2.46	2.38
Bar iron (2.00@2.10 at mill)	2.53	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
⅜	8.50		12@13
⅛	7.15		11@12
5/32 to ¼	6.75		10@11

High speed steel is quoted in Cleveland at 90c. per lb.

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York			13.62½
Tin, 5-ton lots, New York			30.25
Lead (up to carlots), St. Louis, 4.60; New York			5.00
Zinc (up to carlots), St. Louis, 4.77½; New York			5.12½
Aluminum, 98 to 99% ingots, 1-ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	5.50	6.50	6.75
Copper sheets, base	20.25@21	20.50@21	23.00
Copper wire (carlots)	14@14.25	17.00	16.25
Copper rods (ton lots)	19.25	21.50	19.50
Copper tubing (100-lb. lots)	20.75	22.50	23.00
Brass sheets (100-lb. lots)	16.25	16.50	18.75
Brass tubing (100-lb. lots)	18.00	18.50	20.50
Brass rods (1,000-lb. lots)	14.25	15.00	15.75
Brass wire	16.75	16.50	.....
Zinc sheets (casks), (8% dis. carlots)	10.50	9.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.00	22.00	19.00
Babbitt metal (best grade)	32.00	41.00	36.00
Babbitt metal (commercial)	16.50	13.50	9.00

—Shop Materials and Supplies

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	10.50
Copper, heavy, and wire	9.50	9.50	9.50
Copper, light, and bottoms	8.50	8.50	8.75
Lead, heavy	3.75	3.50	3.50
Lead, tea	2.75	2.50	3.00
Brass, heavy	5.75	5.50	8.50
Brass, light	4.25	4.00	5.00
No. 1 yellow brass turnings	5.00	5.00	5.25
Zinc	2.75	2.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	12.00	14.50
IC,	112 sheets	12.80	12.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb.	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13¼x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.87	.99	.91
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	$3.25@3.50	
Coke, prompt foundry, Connellsville	per net ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-5%	60-10%	60-10-10%
1½ and 1¼x3 in. up to 12 in.	50%	60-10-10%	60-10%
With cold punched sq. nuts	50%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	55%	.....	$4.00 off
Button head bolts, with hex. nuts	35%	$3.90 net	.....
Hex. head and hex. nut bolts	40%	.....	65-5%
Lag screws, coach screws	65%	.....	60%
Square and hex., head cap screws	75—10%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	50-10%	60-10%	50-5%
Bolt ends, with hot pressed nuts	60%	.....	55%
Tap bolts, hex. heads	25%	.....	.....
Semi-finished nuts ⅝ and larger	75%	75-10%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$4.50	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	3.75	3.50	3.50
Washers, round plate, per 100 lb. Off list	4.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.00	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.00	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-5%	60-10-10%	65-5%
Rivets, tinned	60-5%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$3.50	$3.25	$3.00
Cone heads, ditto (net)	3.60	3.35	3.35
1⅛ to 1⅝-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	60-5%	50%	50-10%
Copper burs	40%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.55
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.45	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	.....
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

N. Y., Rochester—L. Petrie, 221 South Ave.—one 8 ft. tinners brake, one 20 in. folder and one crimper.

N. Y., Rome—The Acme Cylinder Grinding Co., M. J. Kernan, Purch. Agt.—grinder and equipment for auto cylinders.

N. Y., Sacketts Harbor—The Weaver Machine Co., W. H. Weaver, Purch Agt.—one portable electric drill, 110 volt, 60 cycle, 3 phase.

N. Y., Warsaw—G. Scott, Clinton St.—complete job printing outfit.

N. Y., Warsaw—The Warsaw Elevator Co.—boring bars, etc. for J 28 in. Gisholt turret lathe.

N. Y., Watertown—F. G. Hall, 219 Arlington St.—bench miller and 14 in. shaper.

N. Y., Watertown—F. F. O'Brien, 267 No. State St.—small portable oxy, acetylene welding out-fit for light work, (used), also one electric driven air compressor and tank.

N. Y., Watertown—The Watertown Battery & Electric Co., Inc., 1313 State St., G. Tolbert, Purch. Agt.—machinery and equipment for the manufacture of storage batteries and electric equipment for testing and charging.

N. Y., Yorkville—The Railway Silk Corp., R. B. Pfleeger, Purch. Agt.—silk weaving machinery and equipment and transmission equipment.

N. C., Bailey—S. Wilson—saw mill and woodworking outfit.

N. C., Eller—C. W. Rothrock—saw mill, No. 1 Lane preferred, (used).

O., Cincinnati—The Jones Machine Tool Co., 435 East Pearl St., A. Jones, Purch. Agt.—one No. 55 or No. 60 Heald cylinder grinder.

O., Cincinnati—The Randle Mchy. Co., Cincinnati, Hamilton & Dayton R.R. and Powers St., G. Bierbaum, Purch. Agt.—guillotine shear, to shear two 12 in. x 2½ in. bars or four 8 in. x 2 in. bars with motor drive, 60 cycle, 220 volts, 3 phase, ac.

O., Cleveland—The Amer. Steel & Wire Co., Western Reserve Bldg.—one 18 x 8 and one 16 x 8 lathe, both belt driven.

O., Cleveland—The S. H. Vehicle Co., 3291 East 65th St.—one 8 in. jointer (used).

O., Columbus—The Bingham Mfg. Co., 31 East Livingston Ave., H. N. Bingham, Pres. and Genl. Mgr.—two milling machines, one turret lathe, two smaller lathes and two broaching machines.

O., Columbus—The Smith Lumber and Supply Co., 1845 East Long St., A. H. Smith, Pres.—purchased plant of Columbus Woodworking Co. and will install additional machinery including bender and planer.

O., West Park—The city, W. Dahm, Dir. Pub. Serv.—one 3 yd. steel dump body and hydraulic hoist.

Pa., Germantown—W. Whitaker & Sons, (cotton goods)—new Draper looms.

Pa., Penbrook—The Penbrook Knitting Co., J. L. Lenker, Pres.—sixteen machines with auxiliary apparatus for wool yarn manufacturing.

Pa., Phila.—Ayears Mfg. Co., Mascher and Turner Sts.—looms, shafting, hangers, etc.

Pa., Phila.—The Belgrade Textile Mills Inc., 2848 Belgrade St., A. Bartelt, Vice Pres.—machinery for textile manufacturing.

Pa., Phila.—Chair Exchange, 6th and Vine Sts.—several woodworking machines (used).

Pa., Phila.—The city, Dept. of Hy., 216 City Hall, F. C. Dunlap, Engr.—one threading machine, tire bender, tire and axel upsetter and welder, one 20 in. stationary head upright drilling machine and one single end power shear.

Pa., Phila.—The Electric Fdry. & Machine Co., Tacony and Bleigh Sts.—electrical furnaces, cranes and other machinery for new foundry.

Pa., Phila.—The Fowler Botting & Fiber Mills, 2217 Frankford Ave.—machinery for the manufacture of fiber and jute.

Pa., Phila.—The Grissinger Machine Wks., 904 Quarry St.—additional machinery for new factory.

Pa., Phila.—W. Jahnke & Son, 1825 North 5th St.—manufacturers of truck bodies and wagons—additional wood working machinery for new addition.

Pa., Phila.—J. Kalter Co., 1621 Ridge Ave., manufacturer of lighting fixtures—additional drilling machines, cutters, lathes, etc.

Pa., Phila.—W. E. Knipe & Sons, Hancock and Berks Sts.—dyeing and finishing machinery for new factories, also equipment for machine shop.

Pa., Phila.—T. E. Millership, 3241 Germantown Ave.—additional metal working machinery for new factory addition.

Pa., Phila.—M. Moister & Co., 3931 North 5th St.—additional woodworking machinery.

Pa., Phila.—Moore & White Co., 15th St. and Lehigh Ave.—additional machinery for new machine shop.

Pa., Phila.—The Morice Twine Co., 84 Tasker St. — twine manufacturing machinery for new factory.

Pa., Phila. — The Newmont Mills, Inc., Amber and Westmoreland Aves.—textile machinery for new mill.

Pa., Phila.—The Quaker City Cold Storage Co., 301 South Water St.—additional machinery for plant on Water St.

Pa., Phila.—C. P. Roberts & Co., 1210 Arch St.—wall paper machines.

Pa., Phila.—The Rogers Hosiery Co., Lena and Collon Sts.—automatic knitters, etc.

Pa., Phila.—J. A. Welsh, 1521 North Bodine St., or 1507 North Lawrence St.—equipment for new foundry.

Pa., Phila.—Wittman-Moriarity Co., 4th and Vine Sts.—conveyors and leather working machinery in new factory.

Pa., Phila.—The Zenith Mills, 2nd St. and Allegheny Ave., S. Dryfoos, Purch Agt.—additional looms, shafting, pulleys, etc., in new factory on Clearfield and A Sts.

Pa., Sharpsburg—The Sharpsburg Fdry. Co.—one cupola and several flasks.

Pa., Warren—The Broadbent Laundry—machinery suitable for rug cleaning, etc.

S. C., Greenville—J. E. Thackson—canning machinery and equipment for small canning plant.

S. C., St. Matthews—The Calhoun Twine Mill, A. S. Smoke, Mgr.—mill machinery for producing No. 8 yarn for mill which will soon be built; about 1,200 spindles will be operated.

Va., Richmond—The Lombardy St. Auto Repair Shop, 13 South Lombardy St., L. D. Gilbert, Mgr.—lathes, drill presses and full line of hand tools.

Va., Roanoke—The Greenstone Products Co., 1st Natl. Bank Bldg., C. E. Cosby, Purch. Agt.—six 5 or 6 yd. two-way dump cars, 36 in. gage; 12 to 15 ton of 30 lb. rails with splice bars. (Delivery at Deerfield, Md.)

Va., Stuart—J. D. Blackard Stave & Cooperage Co.—pendulum heading saw and heading jointer.

W. Va., Wheeling—The Wheeling Machine Products Co., 1920 Main St., E. W. Krause, Treas. and Genl. Mgr.—one 250 to 300 hp. direct connected steam generator unit including boiler, Ball, Allis Chalmers or Ides preferred.

Wis., Beloit—J. H. Saris, 412 Broad St.—repair tools for garage including lathe and press.

Wis., Chippewa Falls—W. E. Maddux—light power woodworking machinery.

Wis., Mayville—The Peerless Traveling Goods Co.—special machinery for proposed leather goods factory on Main St.

Wis., Merrill—Allen & Zander, H. R. Allen, Purch. Agt.—drill press, air compressor and gasoline storage tank and pump.

Wis., Milwaukee—The Amer. Knitting Co., 464 12th St., W. Schmitz, Purch. Agt.—special knitting machinery, individual motor power.

Wis., Milwaukee—The Argo Tool & Machine Mfg. Co., 345 25th Ave., C. E. Helm, Purch. Agt.—punch press for broaching.

Wis., Milwaukee—B. H. Arnold, 4001 Brown St.—lathe with 30 in or 36 in. bed, 9 in. swing, motor power.

Wis., Milwaukee — F. Gehrmann, 1020 Grant St.—one arbor press.

Wis., Milwaukee—Jensen & Lindemann, 1105 11th St.—additional sheet metal machinery including beader and shear.

Wis., Milwaukee—P. Kral, 1303 Holton St.—upright boring machine and one sticker.

Wis., Port Washington—Huettman & Peiffer, 117 Park St., F. Peiffer, Purch. Agt.—one chain hoist suitable for small machine shop use, one air compressor, one jack and one electric motor.

Wis., Wausau—The Levenhagen Dairy Co., 612 3rd St.—dairy and refrigerating machinery for proposed plant on Washington St.

Ont., Fergus—Dye Intermediates, Ltd.—electrically operated equipment for making dye intermediates.

Ont., Goderich—The Goderich Salt Co., Maitland St—special salt handling equipment and additional equipment to double its capacity. Estimated cost, $30,000.

Ont., Lambeth — A. Jones — complete equipment for garage and auto repair shop. Estimated cost, $40,000.

Ont., Parry Sound—Tudhope & Ludgate—equipment for proposed saw mill at Deer Lake.

Ont., Rodney—Faulds & Mulligan—complete equipment for garage and auto repair shop. Estimated cost, $45,000.

Ont., St. Thomas—Wood Gorrie Motors, Ltd., has taken over an old factory and will install equipment for assembling cars. Estimated cost, $35,000.

Ont., Windsor—The Canadian Aluminum & Brass Co., Windsor Ave.—equipment for manufacturing castings for automobiles. Estimated cost, $25,000.

Que., Montreal—The United Auto Supplies, Ltd., 68 Laurier Ave., W.—machine tools and lathe for general auto repairs.

Metal Working Shops

Cal., San Francisco — C. H. Peterson, Sharon Bldg., is receiving bids for the construction of a 1 story motor truck plant on Dore and Folsom Sts. Estimated cost, $27,000. The Italia Motor Truck Co., 555 10th St., lessee. M. Sheldon, 110 Sutter St., Archt.

Conn., New Haven—The Amer. Steel & Wire Co., 238 Fairmount Ave., will build a 1 story, 25 x 90 ft. steel and wire manufacturing plant on Fairmount Ave. Estimated cost, $40,000.

Conn., Wallingford—The Wallingford Steel Co., 60 Academy St., will build a factory for the manufacture of metal goods, including a 1 story, 100 x 130 ft., 1 story, 40 x 100 ft. and 1 story, 25 x 100 ft. buildings. Estimated cost, $60,000. Noted Feb. 23.

Ill., Chicago — B. Boches, 1608 South Central Park Ave., is receiving bids for the construction of a 1 story, 72 x 125 ft. garage at 1731-39 Roosevelt Rd. Estimated cost, $40,000. M. L. Bein, 137 North Clark St., Archt.

Ind., Ft. Wayne—Day & Zimmerman, Engrs., 608 Chestnut St., Phila., Pa., are receiving bids for the construction of an automobile factory for the International Harvester Co., 114 West Wayne St. Estimated cost, $500,000.

Minn., St. Paul—G. J. Kramer, 487 Aurora Ave., will receive bids until March 20 for the construction of a 1 story, 125 x 127 ft. garage on University and Farrington Aves. Estimated cost, $40,000. R. F. Palmer, Commercial State Bank Bldg., Engr.

N. Y., Albany—H. Rogers, Archt., 443 Bway., will receive bids about March 20 for the construction of a 3 story, 74 x 122 ft. garage on Chapel and Orange Sts. for W. W. Farley, 77 Chapel St. Estimated cost, $100,000.

Pa., Phila.—T. E. Millership, 3241 Germantown Ave. (metal worker) will soon award the contract for the construction of a 2 story, 25 x 70 ft. addition to shop. Estimated cost, $20,000. S. B. Vanderslip, Kennelsworth Apts., Archt.

Pa., Phila.—Moore & White, 15th St. and Lehigh Ave., are receiving bids for the construction of a 2 story, 60 x 165 ft. machine shop on Lehigh Ave. Estimated cost, $35,000. Private plans.

Pa., Phila.—The Phila. Steam Heating Co., Juniper and Arch Sts., has awarded the contract for the construction of a 2 story, 51 x 123 ft. office and shop at 3318-22 Lancaster Ave. Estimated cost, $60,000. Noted **Jan. 6.**

Pa., Pittsburgh—J. C. Forster & Son have awarded the contract for the construction of a 2 story, 50 x 100 ft. plant at 2519 Penn Ave. for the manufacture of tinware, steel dies, etc. Estimated cost, $40,000. Noted Mar. 9.

Wash., Puget Sound — The Bureau of Yards and Docks, Navy Dept., Wash., D. C., will receive bids until April 12 for Ordnance plant extension to Bldg. No. 368.

Ont., Fergus—Dye Intermediates, Ltd., will take over factory and equip same for the manufacture of dye intermediates, also install filtration plant. Estimated cost, $40,000. J. E. Windsor, c/o owner, Engr.